

United States Department of Agriculture

Natural Resources Conservation Service In cooperation with Texas Agricultural Experiment Station

Soil Survey of Live Oak County, Texas



How To Use This Soil Survey

General Soil Map

The general soil map, which is a color map, shows the survey area divided into groups of associated soils called general soil map units. This map is useful in planning the use and management of large areas.

To find information about your area of interest, locate that area on the map, identify the name of the map unit in the area on the color-coded map legend, then refer to the section **General Soil Map Units** for a general description of the soils in your area.

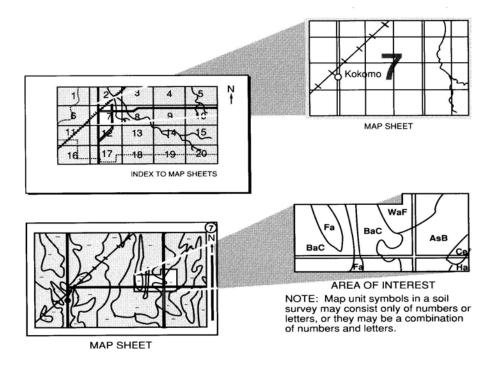
Detailed Soil Maps

The detailed soil maps can be useful in planning the use and management of small areas.

To find information about your area of interest, locate that area on the **Index to Map Sheets**. Note the number of the map sheet and go to that sheet.

Locate your area of interest on the map sheet. Note the map unit symbols that are in that area. Go to the **Contents**, which lists the map units by symbol and name and shows the page where each map unit is described.

The **Contents** shows which table has data on a specific land use for each detailed soil map unit. Also see the **Contents** for sections of this publication that may address your specific needs.



This soil survey is a publication of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service has leadership for the Federal part of the National Cooperative Soil Survey.

Major fieldwork for this soil survey was completed in 1995. Soil names and descriptions were approved in 1996. Unless otherwise indicated, statements in this publication refer to conditions in the survey area in 1996. This survey was made cooperatively by the Natural Resources Conservation Service and the Texas Agricultural Experiment Station. The survey is part of the technical assistance furnished to the Live Oak Soil and Water Conservation District. The most current official data are available at http://websoilsurvey.nrcs.usda.gov/app/

Soil maps in this survey may be copied without permission. Enlargement of these maps, however, could cause misunderstanding of the detail of mapping. If enlarged, maps do not show the small areas of contrasting soils that could have been shown at a larger scale.

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Cover: The natural gas rig in the background stands in an area of Cotulla clay loam, 1 to 3 percent slopes. Olmos very gravelly sandy loam, 1 to 8 percent slopes, is in the foreground.

Additional information about the Nation's natural resources is available on the Natural Resources Conservation Service homepage on the World Wide Web. The address is http://www.nrcs.usda.gov

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Foreword

This soil survey contains information that affects land use planning in this survey area. It contains predictions of soil behavior for selected land uses. The survey also highlights soil limitations, improvements needed to overcome the limitations, and the impact of selected land uses on the environment.

This soil survey is designed for many different users. Farmers, ranchers, and agronomists can use it to evaluate the potential of the soil and the management needed for maximum food and fiber production. Planners, community officials, engineers, developers, builders, and home buyers can use the survey to plan land use, select sites for construction, and identify special practices needed to ensure proper performance. Conservationists, teachers, students, and specialists in recreation, wildlife management, waste disposal, and pollution control can use the survey to help them understand, protect, and enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. The information in this report is intended to identify soil properties that are used in making various land use or land treatment decisions. Statements made in this report are intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are shallow to bedrock. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

These and many other soil properties that affect land use are described in this soil survey. Broad areas of soils are shown on the general soil map. The location of each soil is shown on the detailed soil maps. Each soil in the survey area is described. Information on specific uses is given for each soil. Help in using this publication and additional information are available at the local office of the Natural Resources Conservation Service or Texas Cooperative Extension.

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Soil Survey of Live Oak County, Texas

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United States Department of Agriculture, Natural Resources Conservation Service, in cooperation with the Texas Agricultural Experiment Station

Live Oak County is located in south Texas (fig. 1). It is bordered on the north by Atascosa and Karnes Counties; east by Bee and San Patricio Counties; south by Duval and Jim Wells Counties; and west by McMullen County. The two largest towns are George West and Three Rivers. George West is the county seat with a population of about 2,700. It is near the center of the county and is about 65 miles northwest of Corpus Christi. Elevation of the county ranges from about 70 feet above sea level to 400 feet above sea level. Annual rainfall is about 24 inches and the growing season is about 288 days. Oil and gas is the largest nonagricultural industry in the county.

Live Oak County has a land area of 664,066 acres and a water area of 26,577 acres for a total of 690,643 acres or 1,079 square miles.

The county lies mostly within the Rio Grande Plain Major Land Resource Area with a small portion in the Gulf Coast Prairie Major Land Resource Area. The topography is mainly gently undulating to rolling with a few nearly level areas. The county is drained by the Nueces, Frio, and Atascosa Rivers. Most of the county is rangeland. About 75,000 acres is cultivated. The main crops are grain sorghum, corn, cotton, and winter wheat. About 67,500 acres are in pastureland.

General Nature of the County

This section provides general information about Live Oak County. It describes the history and climate.

History

Prepared by Jim Warren, Archeologist and local historian, George West, Texas.

The earliest inhabitants of what is now Live Oak County were nomadic Indians who roamed up and down the rivers and large streams as much as 10,000 to 12,000 years ago. Very little is known about these Paleo-Indians other than the fact that they used a distinctive type of dart or short spear with a fluted flint point to hunt now-extinct large animals.

The Indians who met the first European travelers in the area were the Lipan Apaches and Comanches who made periodic raids into the Nueces Valley capturing wild horses and later preying upon the early settlers. These Indians were not native to this part of Texas, but came into the area from the High Plains of Texas, Colorado, and Oklahoma.

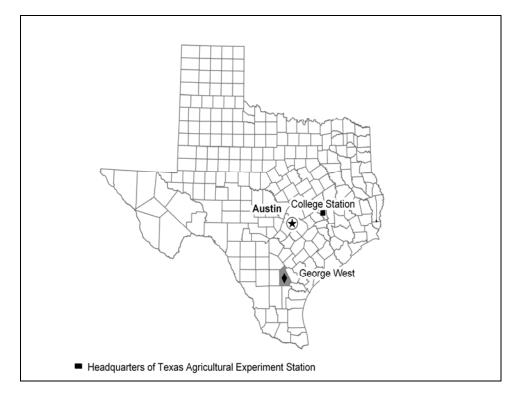


Figure 1.—Location of Live Oak County, Texas.

The first European travelers in the area were Spanish military who crossed the Nueces River on their trips from Laredo and Camargo to Goliad and Indianola in the late 18th century. The earliest recorded settlement in present Live Oak County is known as Fort Ramirez, which was actually a fortified ranch house built sometime after 1790. It was the headquarters for the father and son partnership of Jose Antonio and Jose Victoriano Ramirez who received Spanish land grants of four leagues each on the west bank of the Nueces River. The Ramirez holdings were abandoned in 1813 because of increased Indian depredations resulting from the withdrawal of Spanish troops from Texas during the first Mexican revolution (1810 to 1821).

In 1828, two Irish entrepreneurs, John McMullen and James McGloin, obtained an empresario grant from the Mexican government to create a colony on the lower Nueces River. Their colony was eventually established at present San Patricio about 35 miles downstream from George West on the east bank of the Nueces. Their grant extended north and west into present Live Oak and McMullen Counties. Some of the colonists eventually moved up the Nueces and settled in Live Oak County at Gussettville.

Permanent settlement in the county received a boost following the U.S.-Mexican War of 1846-1847, when many of the returning veterans selected land in the Nueces valley rather than returning to their original homes elsewhere. About this same time, land promoters such as Col. H.L. Kinney began a concerted effort to lure more settlers to the area around Corpus Christi and extending up the Nueces valley into present Live Oak County. At one time Col. Kinney offered a free town lot in Corpus Christi to purchasers of farm lots in the area.

Another direct result of the U.S.-Mexican War was the establishment of a line of military forts along the Rio Grande and later a second line on the Nueces River. This second line of defense was anchored on the east by Fort Merrill on the west bank of the Nueces River in Live Oak County. The fort was established in 1850 and served to protect the local settlers from Indian and bandit raids and expected incursions by Mexican forces who still considered the Nueces as the boundary between Texas and Mexico. Fort Merrill

was abandoned in 1856 after the local situation appeared to be stabilized and the settled frontier shifted to the area west of San Antonio and eventually further north.

Live Oak County was organized in 1856, consisting of portions of Nueces and San Patricio Counties. The first county seat was in Oakville on Sulphur Creek where it remained until 1919 when it was moved to George West after the San Antonio, Uvalde, and Gulf Railroad bypassed Oakville for a route following the west side of the Nueces River.

The first newspaper in the county was the "Lagarto Times" published by S.S. Cox in the community of Lagarto during the last quarter of the 19th century. By 1859, there were post offices at Oakville, Gussettville, and Echo. The First National Bank of Oakville was chartered in 1905.

The earliest record of soil conservation measures in the county was in 1914 when a system of terraces was constructed on the Charles O. Edwards farm in the Mahala community. The terraces were built with a team of mules and a homemade terracing plow.

The town site of George West was platted in 1912 by George W. West, a prominent rancher and San Antonio executive. West had been successful in securing the railroad route through his property, therefore ensuring the success of a new town on the route that overlooked the Nueces Valley.

Three Rivers, the other major population center in the county, was an enterprise of Col. Charles R. Tips who established the town site near the confluence of the Frio, Atascosa, and Nueces Rivers in 1913. Originally named Hamiltonburg, the town was also situated on the railroad route.

Strategically situated between the Rio Grande and Gulf of Mexico, and on the route from central Texas to the Rio Grande Valley, Live Oak County has always been a vital transportation link. The old Spanish trails from Laredo and Camargo to Goliad and Indianola have been replaced by present U.S. Highway 59, which carries traffic between the ports of Houston and Laredo. The north-south artery from San Antonio to Brownsville has been replaced by U.S. Highway 281 and Interstate Highway 37 connecting San Antonio to Corpus Christi, Brownsville, and McAllen.

George West and Three Rivers remain the two main population centers in the county. For many of its formative years, ranching and farming were the main commercial enterprises in the county prior to the advent of oil and gas production in the early 20th century.

Climate

Prepared by the Natural Resources Conservation Service National Water and Climate Center, Portland, Oregon.

Table 1 provides data on temperature and precipitation for the survey area as recorded at Tilden in the period 1971 to 2000. Table 2 shows probable dates of the first freeze in fall and the last freeze in spring. Table 3 provides data on the length of the growing season.

In winter, the average temperature is 55.5 degrees F and the average daily minimum temperature is 42.8 degrees. The lowest temperature on record, which occurred at Tilden on December 23, 1989, is 5 degrees. In summer, the average temperature is 84.7 degrees and the average daily maximum temperature is 97.2 degrees. The highest temperature, which occurred at Tilden on July 2, 1910, is 119 degrees.

Growing degree days are shown in Table 1. They are equivalent to "heat units". During the month, growing degree days accumulate by the amount that the average temperature each day exceeds a base temperature (50 degrees F). The normal monthly accumulation is used to schedule single or successive plantings of a crop between the last freeze in spring and the first freeze in fall.

The average annual total precipitation is about 23.4 inches. Of this, about 21.1 inches, or 90 percent, usually falls in February through November. The growing season

for most crops falls within this period. The heaviest 1-day rainfall during the period of record was 6.9 inches at Tilden on September 22, 1967. Thunderstorms occur on about 37 days each year, and most occur in May.

The average seasonal snowfall is 0.1 inches. The greatest snow depth at any one time during the period of record was 5 inches recorded on January 12, 1985. On an average, 0 days per year have at least 1 inch of snow on the ground. The heaviest 1-day snowfall on record was 5.0 inches recorded on January 12, 1985.

The average relative humidity in mid-afternoon is about 52 percent. Humidity is higher at night, and the average at dawn is about 84 percent. The sun shines 71 percent of the time in summer and 48 percent in winter. The prevailing wind is from the south-southeast. Average wind speed is highest, 9.7 miles per hour, in April.

How This Survey Was Made

This survey was made to provide information about the soils and miscellaneous areas in the survey area. The information includes a description of the soils and miscellaneous areas and their location and a discussion of their suitability, limitations, and management for specified uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They dug many holes to study the soil profile, which is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

The soils and miscellaneous areas in the survey area are in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept or model of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in

different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

The descriptions, names and delineations of the soils in this survey area do not fully agree with those of the soils in adjacent survey areas. Differences are the result of better knowledge of soils, modifications in series concepts, or variations in the intensity of mapping or in the extent of the soils in the survey area.

General Soil Map Units

The general soil map in this publication shows broad areas that have a distinctive pattern of soils, relief, and drainage. Each map unit on the general soil map is a unique natural landscape. Typically, it consists of one or more major soils or miscellaneous areas and some minor soils or miscellaneous areas. It is named for the major soils or miscellaneous areas. The components of one map unit can occur in another but in a different pattern.

The general soil map can be used to compare the suitability of large areas for general land uses. Areas of suitable soils can be identified on the map. Likewise, areas where the soils are not suitable can be identified.

Because of its small scale, the map is not suitable for planning the management of a farm or field or for selecting a site for a road or building or other structure. The soils in any one map unit differ from place to place in slope, depth, drainage, and other characteristics that affect management.

1. Weesatche-Pernitas

Very deep, very gently sloping or gently sloping, well drained, noncalcareous and calcareous, loamy soils

This map unit makes up 164,442 acres, or about 24 percent of the county (fig. 2). It is about 38 percent Weesatche soils, 28 percent Pernitas soils, and 34 percent minor soils.

The landscape consists of hills and ridges dissected by narrow drainageways and tributaries of major streams. The Weesatche and Pernitas soils are on backslope and footslope positions on hills and ridges.

The Weesatche soils are very deep, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown fine sandy loam about 7 inches thick. The upper part of the subsoil from a depth of 7 inches to 31 inches is dark grayish brown and brown sandy clay loam. The lower part of the subsoil from a depth of 31 inches to 80 inches is pale brown, light yellowish brown, and pink sandy clay loam.

The Pernitas soils are very deep, well drained, and moderately permeable. Typically, the surface layer is very dark grayish brown fine sandy loam about 7 inches thick. The upper part of the subsoil from a depth of 7 inches to 35 inches is very dark grayish brown, dark brown, and brown sandy clay loam. The lower part of the subsoil from a depth of 35 inches to 80 inches is very pale brown sandy clay loam and very pale brown loam.

Soils of minor extent include Annarose, Clareville, Papalote, Sarnosa, and small areas of other soils. The Annarose soils occur on summits and are moderately deep. The Clareville and Papalote soils occur in slightly lower positions along stream terraces and upland drainageways. The Sarnosa soils occur on slightly higher positions.

The major soils are used as rangeland and improved pasture. The main management concerns are the water erosion hazard and depth to carbonates.

Rangeland productivity is medium for Pernitas soils and high for Weesatche soils. When properly managed, areas of native vegetation produce a wide variety of grasses, forbs, and browse plants for livestock and wildlife. These areas are preferred sites for deer, are good sites for quail, and are used by dove and turkey.

These soils are well suited to most urban uses. Seepage and moderate shrink-swell potential are limitations. Low strength limits the use for roads and streets. The soils are well suited to recreation uses. Slope is a limitation in some places.

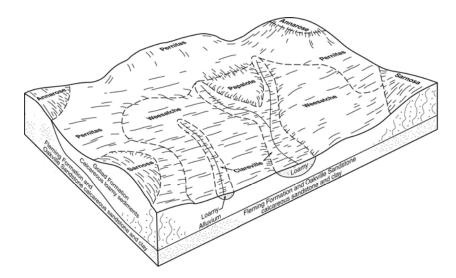


Figure 2.—Pattern of soils and underlying material in the Weesatche-Pernitas general soil map unit.

2. Olmos-Sarnosa-Weesatche

Very shallow, shallow and very deep, very gently sloping to moderately sloping, well drained, gravelly and loamy soils

This unit makes up 109,618 acres, or about 16 percent of the county (fig. 3). It is about 34 percent Olmos soils, 18 percent Sarnosa soils, 17 percent Weesatche soils, and about 31 percent minor soils.

The landscape consists of hills and ridges dissected by drainageways and their associated narrow valleys. The Olmos soils are on summit positions on hills and ridges. The Sarnosa soils are on side slopes of hills. The Weesatche soils are on concave footslope positions on hills and ridges adjacent to drainageways.

The Olmos soils are very shallow and shallow, well drained, and moderately permeable. Typically, the surface layer is very dark grayish brown, very gravelly sandy loam about 8 inches thick. The subsoil, from a depth of 8 inches to 18 inches, is brown extremely gravelly sandy loam. The underlying material from a depth of 18 inches to 30 inches is white and very pale brown caliche that is indurated. The lower part of the underlying material from a depth of 30 inches to 80 inches is white and pink weakly cemented caliche and becomes less cemented with depth.

The Sarnosa soils are very deep, well drained, and moderately permeable. Typically, the surface layer is very dark grayish brown fine sandy loam about 6 inches thick. The upper part of the subsoil, from a depth of 6 inches to 34 inches is very dark grayish brown and brown sandy clay loam. The lower part of the subsoil from a depth of 34 inches to 80 inches is pale brown and very pale brown sandy clay loam and fine sandy loam.

The Weesatche soils are very deep, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown fine sandy loam about 7 inches thick. The upper part of the subsoil from a depth of 7 inches to 31 inches is dark grayish brown and brown sandy clay loam. The lower part of the subsoil from a depth of 31 inches to 80 inches is pale brown, light yellowish brown, and pink sandy clay loam.

Soils of minor extent include Goliad, Lacoste, Pettus, Parrita, Pernitas, and small areas of other soils. The Lacoste, Parrita, and Pettus soils occur on similar landscapes as the Olmos soils. The Pernitas soils are on lower landscapes than Sarnosa soils. The Goliad soils are on lower landscapes than Olmos soils.

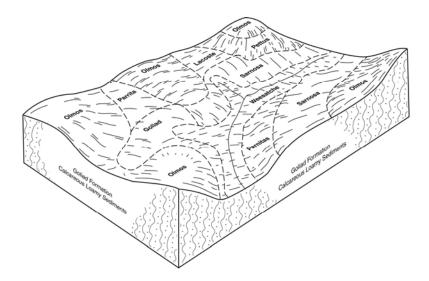


Figure 3.—Pattern of soils and underlying material in the Olmos-Sarnosa-Weesatche general soil map unit.

The major soils are used as rangeland and wildlife habitat. The Olmos and Sarnosa soils are not suited to crops. Very low available water capacity, a high content of gravel, the depth to a cemented layer, and the water erosion hazard are the main management concerns.

Rangeland productivity is low for Olmos soils, medium for Sarnosa soils, and high for Weesatche soils. If properly managed, areas that support native vegetation produce a variety of grasses, forbs, and browse for livestock. These areas are preferred sites for quail, are good sites for dove, and are inhabited by turkey and deer.

The major soils are poorly suited or moderately suited to most urban uses and are poorly suited to most recreational uses. The Olmos soils are a potential source of caliche for construction.

3. Eloso-Rosenbrock

Moderately deep and deep, nearly level or very gently sloping, well drained, clayey soils

This unit makes up about 108,287 acres or 16 percent of the county (fig. 4). It is about 49 percent Eloso soils and similar soils, 21 percent Rosenbrock soils and similar soils, and about 30 percent minor soils.

The landscape consists of low hills dissected by small creeks and broad drainageways. The Eloso soils are on low hills and ridges. The Rosenbrock soils are in drainageways and toeslope positions on hills and ridges.

The Eloso soils are moderately deep, well drained, and very slowly permeable. Typically, the surface layer is very dark gray clay about 18 inches thick. The subsoil from a depth of 18 inches to 30 inches is light brownish gray clay. The underlying material from a depth 30 inches to 80 inches is pink noncemented siltstone of silt loam texture.

The Rosenbrock soils are deep, well drained, and very slowly permeable. Typically, the surface layer is very dark gray clay about 8 inches thick. The upper subsoil from a depth of 8 inches to 52 inches is very dark gray and dark grayish brown clay. The lower subsoil from a depth of 52 inches to 59 inches is light brownish gray clay. The underlying material from a depth of 59 inches to 80 inches is light brownish gray clay loam and light gray noncemented siltstone.

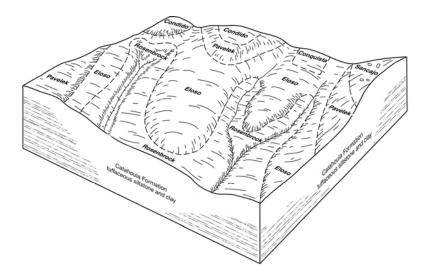


Figure 4.—Pattern of soils and underlying material in the Eloso-Rosenbrock general soil map unit.

Soils of minor extent include Condido, Conquista, Pavelek, Sancajo, and small areas of other soils. The Condido and Pavelek soils occur on slightly higher positions on hills and ridges above the Eloso soils. The Conquista soils are mined and reclaimed areas. The Sancajo soils mainly occur on the summits of the highest ridges on the landscape.

The major soils are used as rangeland and pasture. They are not suited to crops. The main management concerns are low available water capacity and water erosion hazard.

Rangeland productivity is medium. When properly managed, areas of native vegetation produce a wide variety of grasses, forbs, and browse plants for livestock and wildlife. These areas are preferred sites for deer, are good sites for quail, and are used by dove and turkey.

4. Sarnosa-Weesatche

Very deep, very gently sloping to moderately sloping, well drained, loamy soils

This unit makes up about 57,689 acres or 8 percent of the county. It is about 49 percent Sarnosa soils and similar soils, 24 percent Weesatche soils and similar soils, and about 27 percent minor soils.

The landscape consists of hills and ridges dissected by drainageways and their associated narrow valleys. The Sarnosa soils are mainly on side slopes of hills and ridges. The Weesatche soils are on lower side slopes and concave drainageways.

The Sarnosa soils are very deep, well drained, calcareous and moderately permeable. Typically, the surface layer is very dark grayish brown fine sandy loam about 6 inches thick. The upper part of the subsoil, from a depth of 6 inches to 34 inches is very dark grayish brown and brown sandy clay loam. The lower part of the subsoil from a depth of 34 inches to 80 inches is pale brown and very pale brown sandy clay loam and fine sandy loam.

The Weesatche soils are very deep, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown fine sandy loam about 7 inches thick. The upper part of the subsoil from a depth of 7 inches to 31 inches is dark grayish brown and brown sandy clay loam. The lower part of the subsoil from a depth of 31 inches to 80 inches is pale brown, light yellowish brown, and pink sandy clay loam.

Soils of minor extent in this unit consist of Annarose, Papalote, Sinton, and small areas of other soils. The Annarose soils occur on summit positions above Sarnosa soils.

The Papalote soils are in slightly lower positions below the Weesatche soils on terraces of small creeks. The Sinton soils are on flood plains below the Weesatche soils.

The major soils are used as rangeland and improved pasture. The main management concerns are the water erosion hazard and depth to carbonates.

Rangeland productivity is medium for Sarnosa soils and high for Weesatche soils. When properly managed, areas of native vegetation produce a wide variety of grasses, forbs, and browse plants for livestock and wildlife. These areas are preferred sites for deer, are good sites for quail, and are used by dove and turkey.

These soils are suited to most urban uses. Seepage and moderate shrink-swell potential are limitations. Low strength limits the use for roads and streets. The soils are suited to most recreation uses. Slope is a limitation in some places.

5. Pernitas-Annarose

Very deep and deep, very gently sloping or gently sloping, well drained, calcareous loamy soils

This unit makes up about 52,314 acres or 8 percent of the county. It is about 45 percent Pernitas soils, 25 percent Annarose soils, and about 30 percent minor soils.

The landscape consists of hills and ridges dissected by drainageways and their associated narrow valleys. The Pernitas soils are mainly on backslope and footslope positions on hills and ridges. The Annarose soils are higher in the landscape on summit and shoulder positions.

The Pernitas soils are very deep, well drained, and moderately permeable. Typically, the surface layer is very dark grayish brown fine sandy loam about 7 inches thick. The upper part of the subsoil from a depth of 7 inches to 36 inches is very dark grayish brown, dark brown, and brown sandy clay loam. The lower part of the subsoil from a depth of 36 inches to 80 inches is pale brown and very pale brown sandy clay loam and clay loam.

The Annarose soils are deep, well drained, and moderately permeable. Typically, the surface layer is pale brown fine sandy loam about 9 inches thick. The upper part of the subsoil from 9 inches to 25 inches is light yellowish brown sandy clay loam. The lower part of the subsoil from a depth of 25 inches to 50 inches is very pale brown sandy clay loam and fine sandy loam. The underlying material from 50 inches to 80 inches is very pale brown noncemented sandstone.

Soils of minor extent include Danjer, Sinton, Weesatche, and small areas of other soils. The Danjer and Weesatche soils occur in slightly lower positions than Pernitas soils. The Sinton soils occur in lower positions along flood plains.

The major soils are used as rangeland and wildlife habitat. The Pernitas soils are moderately suited to irrigated crops. The main limitations concerns are low available water capacity and water erosion hazard.

Rangeland productivity is medium. When properly managed, areas of native vegetation produce a variety of grasses, forbs, and browse plants for livestock and wildlife.

The major soils are moderately well suited to most urban and recreational uses. Slope is a limitation in some places.

6. Buchel-Sinton

Very deep, nearly level, moderately well drained, clayey and loamy soils

This unit makes up about 52,069 acres or about 8 percent of the county. It is about 46 percent Buchel soils, 33 percent Sinton soils, and about 21 percent minor soils.

The landscape consists of broad flood plains along rivers and large creeks. It is dissected by numerous sloughs and channels. Stream terraces, hills, and ridges are near the boundary of the unit. The Buchel and Sinton soils are on the flood plains.

The Buchel soils are very deep, moderately well drained, and very slowly permeable. Typically, the surface layer is very dark gray clay about 8 inches thick. The upper part of the subsoil, from a depth of 8 inches to 42 inches, is very dark gray and dark gray clay. The lower part of the subsoil from 42 inches to 80 inches is dark grayish brown, grayish brown, and pale brown clay.

The Sinton soils are very deep, well drained, and moderately permeable. Typically, the surface layer is very dark grayish brown sandy clay loam about 25 inches thick. The subsoil from a depth of 25 inches to 80 inches is brown and yellowish brown sandy clay loam.

Soils of minor extent include Odem, Sarnosa, Weesatche, and small areas of other soils. The Odem soils are on slightly higher landscape positions on natural levees. The Sarnosa and Weesatche soils are on higher landscape positions.

The major soils are used mainly as cropland, improved pasture, and rangeland. The main management concern is flooding hazard. Frequently flooded areas are not suited to cropland.

Rangeland productivity is high. If properly managed, areas that support native vegetation provide a wide variety of forage for livestock and excellent food and cover for wildlife. These areas are preferred sites for turkey and are heavily used by deer, quail, and dove.

The major soils are not suited to urban use due to severe flooding hazard. They are poorly suited or moderately suited to most recreational uses.

7. Esseville

Moderately deep, nearly level to gently sloping, well drained, clayey, saline soils

This unit makes up about 35,866 acres or 5 percent of the county (fig. 5). It is about 63 percent Esseville soils and 37 percent minor soils.

The landscape consists of smooth plains on broad interfluves, dissected by the valleys of large creeks and small upland drainageways. The Esseville soils are mainly on the upland plains.

The Esseville soils are moderately deep to shale, well drained, and very slowly permeable. Typically, the surface layer is very dark gray clay about 5 inches thick. The upper subsoil from a depth of 5 inches to 18 inches is very dark gray clay. The lower subsoil from 18 inches to 36 inches is dark gray slightly saline clay and light gray moderately saline clay. The underlying material from 36 inches to 80 inches is light gray moderately saline and pale yellow moderately saline noncemented claystone of clay texture.

Soils of minor extent include Campbellton, Fashing, Laparita, and small areas of other soils. The Campbellton and Fashing soils occur on slightly higher positions. The Laparita soils occur in slightly lower positions.

The major soils are used as rangeland, cropland, and pasture. Some areas are used as wildlife habitat.

Rangeland productivity is medium. When properly managed, areas of native vegetation produce a wide variety of grasses, forbs, and browse plants for livestock and wildlife.

The main crops are grain sorghum and small grains. The main management concerns are salinity and water erosion hazard.

The Esseville soils are poorly suited to most urban and recreational uses. High shrink-swell and very slow permeability are the main limitations.

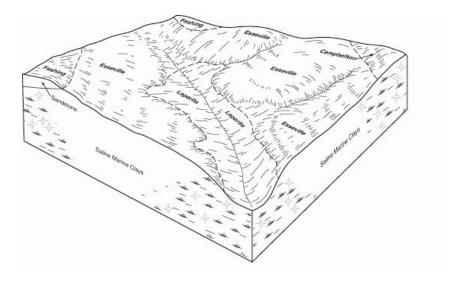


Figure 5.—Pattern of soils and underlying material in the Esseville general soil map unit.

8. Papalote-Weesatche-Coy

Very deep, nearly level to gently sloping, moderately well drained and well drained, loamy and clayey soils

This unit makes up about 31,547 acres or 5 percent of the county (fig. 6). It is about 33 percent Papalote soils, 23 percent Weesatche soils, 11 percent Coy soils, and 33 percent minor soils.

The landscape consists of drainageways with narrow flood plains, stream terraces, and lower slopes of adjacent hills and ridges. The Coy soils occur in drainageways, and the Papalote soils are on stream terraces. The Weesatche soils are on lower slopes on adjacent hills and ridges.

The Papalote soils are very deep, moderately well drained, and slowly permeable. Typically, the surface layer is dark grayish brown, loamy fine sand about 12 inches thick. The upper part of the subsoil, from a depth of 12 inches to 36 inches is gray sandy clay, and light brownish gray, and strong brown sandy clay loam. The lower part of the subsoil from a depth of 36 inches to 80 inches is pale brown, light gray, very pale brown, and white sandy clay loam.

The Weesatche soils are very deep, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown fine sandy loam about 7 inches thick. The upper part of the subsoil from a depth of 7 inches to 31 inches is dark grayish brown and brown sandy clay loam. The lower part of the subsoil from a depth of 31 inches to 80 inches is pale brown, light yellowish brown, and pink sandy clay loam.

The Coy soils are very deep, well drained, and very slowly permeable. Typically, the surface layer is very dark gray clay loam about 11 inches thick. The upper part of the subsoil from a depth of 11 inches to 50 inches is very dark gray and dark grayish brown clay. The lower part of the subsoil from a depth of 50 inches to 80 inches is brown clay and pale brown clay loam.

Soils of minor extent include Sarnosa, Sinton, Tiocano, and small areas of other soils. The Sarnosa soils occur on higher slopes near the perimeter of the unit. The Sinton soils occur in lower positions along flood plains. The Tiocano soils are in depressions in slightly lower positions.

The major soils are well suited to most agricultural uses. They are used mainly for pasture, cropland, and rangeland. The main management concerns are the hazard of water and wind erosion.

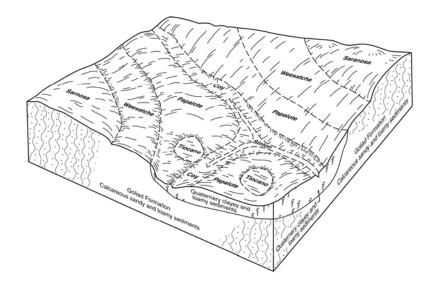


Figure 6.—Pattern of soils and underlying material in the Papalote-Weesatche-Coy general soil map unit.

Rangeland productivity is medium for Coy and Papalote soils, and high for Weesatche soils. When properly managed, areas of native vegetation produce a wide variety of grasses, forbs, and browse plants for livestock and wildlife. These areas are preferred sites for deer, are good sites for quail, and are inhabited by dove and turkey.

The Papalote and Weesatche soils are moderately suited to most urban and recreational uses, and the Coy soils are poorly suited due to very slow permeability and high shrink-swell potential.

9. Nusil-Papalote-Rhymes

Very deep, nearly level to gently sloping, moderately well drained to somewhat excessively drained, sandy soils

This unit makes up about 16,070 acres or 2 percent of the county. It is about 34 percent Nusil soils, 30 percent Papalote soils, 14 percent Rhymes soils, and 22 percent minor soils.

The landscape consists of broad stream terraces overblown with eolian sands. The Nusil soils are on broad, smooth convex areas, the Papalote soils are on lower concave areas, and the Rhymes soils are on hummocks and low dunes.

The Nusil soils are very deep, well drained, and slowly permeable. Typically, the surface layer is pale brown fine sand about 29 inches thick. The subsurface layer from a depth of 29 inches to 37 inches is very pale brown fine sand. The upper part of the subsoil from a depth of 37 inches to 54 inches is light brownish gray and light gray sandy clay loam. The lower part of the subsoil from a depth of 54 inches to 80 inches is light vellowish brown and brownish vellow sandy clay loam.

The Papalote soils are very deep, moderately well drained, and slowly permeable. Typically, the surface layer is dark grayish brown, loamy fine sand about 12 inches thick. The upper part of the subsoil, from a depth of 12 inches to 36 inches is gray sandy clay, light brownish gray, and strong brown sandy clay loam. The lower part of the subsoil from a depth of 36 inches to 80 inches is pale brown, light gray, very pale brown, and white sandy clay loam.

The Rhymes soils are very deep, somewhat excessively drained, and moderately slowly permeable. Typically, the surface layer is pale brown fine sand about 11 inches

thick. The subsurface layer from a depth of 11 inches to 71 inches is very pale brown fine sand. The subsoil from a depth of 71 inches to 80 inches is strong brown sandy clay loam.

Soils of minor extent include Sarnosa, Weesatche, and small areas of other soils. The Sarnosa soils occur on hillslopes on higher positions on the perimeter of the unit. The Weesatche soils are in lower positions than the Papalote soils.

The major soils are used mainly as rangeland or pasture. The main management concerns are low available water capacity and low fertility.

Rangeland productivity is medium. The climax plant community consists of open grassland plants interspersed with a few mesquite trees. A few areas are used for improved pasture grasses, such as coastal bermudagrass.

The major soils are suited to most urban and recreational uses. The shrink-swell potential, sandy textures, and slope are main limitations.

10. Monteola-Cotulla

Very deep, nearly level or very gently sloping, moderately well drained, calcareous, loamy soils

This unit makes up about 14,265 acres or 2 percent of the county. It is about 44 percent Monteola soils and similar soils, 23 percent Cotulla soils and similar soils, and about 33 percent minor soils.

The landscape consists of low hills and ridges dissected by broad drainageways. The Monteola soils are mainly on side slopes of low hills and ridges. The Cotulla soils are mainly on the lower side slopes of hills.

The Monteola soils are very deep, moderately well drained, and very slowly permeable. Typically, the surface layer is very dark gray and dark gray clay about 24 inches thick. The upper part of the subsoil from a depth of 24 inches to 54 inches is dark grayish brown and grayish brown clay. The lower part of the subsoil from a depth of 54 inches to 80 inches is light brownish gray saline clay.

The Cotulla soils are very deep, well drained, and very slowly permeable. Typically, the surface layer is dark grayish brown nonsaline clay loam about 7 inches thick. The upper part of the subsoil from a depth of 7 inches to 18 inches is grayish brown and light brownish gray, nonsaline clay. The middle subsoil from a depth of 18 inches to 34 inches is light brownish gray nonsaline sodic clay, and very saline sodic clay. The lower part of the subsoil from a depth of 34 inches to 80 inches is brown and pale brown slightly saline sodic clay.

Soils of minor extent include Annarose, Pernitas, Sarnosa, and small areas of other soils. The Annarose and Pernitas soils occur on higher positions than Cotulla soils. The Sarnosa soils occur on backslope positions above the Cotulla soils.

The major soils are used as rangeland and wildlife habitat. The main management concerns are the water erosion hazard and salinity.

Rangeland productivity is medium. If properly managed, areas that support native vegetation produce a variety of grasses, forbs, and browse for livestock. These areas are preferred sites for quail, are good sites for dove, and are inhabited by turkey and deer.

The major soils are poorly suited to most urban and recreational uses. High shrinkswell potential and very slow permeability are the main limitations.

11. Lattas

Very deep, nearly level or very gently sloping, moderately well drained, clayey soils

This unit makes up about 11,156 acres or 2 percent of the county. It is about 81 percent Lattas soils, and about 19 percent minor soils.

The landscape consists of broad, level or nearly level plains with few swales or drainageways.

The Lattas soils are very deep, moderately well drained, and very slowly permeable. Typically, the surface layer is very dark gray clay about 14 inches thick. The upper part of the subsoil from a depth of 14 inches to 45 inches is dark gray clay. The lower part of the subsoil from a depth of 45 inches to 80 inches is light gray clay.

Soils of minor extent include Clareville, Coy, Papalote, and small areas of other soils. The Clareville, Coy, and Papalote soils occur on slightly higher positions along the perimeter of the unit.

The Lattas soil is used mainly as cropland. Major crops are grain sorghum, cotton, and corn. The main management concerns are the hazard of water and wind erosion.

Rangeland productivity is medium. When properly managed, areas of native vegetation produce a wide variety of grasses, forbs, and browse plants for livestock and wildlife.

The Lattas soils are poorly suited to most urban and recreational uses. High shrinkswell potential and very slow permeability are the main limitations.

12. Imogene-Buchel

Very deep, nearly level or very gently sloping, moderately well drained and well drained, saline and nonsaline, loamy and clayey soils

This unit makes up about 9,972 acres or 1 percent of the county. It is about 40 percent Imogene soils, 28 percent Buchel soils, and about 32 percent minor soils.

The landscape consists of broad flood plains along the rivers and creeks. Stream terraces, hills, and ridges are near the boundary of the unit. The Imogene soils are on stream terraces of the Atascosa River and its tributaries. The Buchel soils are on flood plains.

The Imogene soils are very deep, moderately well drained, and very slowly permeable. Typically, the surface layer is dark grayish brown fine sandy loam about 8 inches thick. The upper part of the subsoil from a depth of 8 inches to 36 inches is very dark gray and dark grayish brown slightly saline sandy clay loam. The lower part of the subsoil from a depth of 36 inches to 80 inches is dark grayish brown and grayish brown moderately saline sandy clay loam.

The Buchel soils are very deep, moderately well drained, and very slowly permeable. Typically, the surface layer is very dark gray clay about 8 inches thick. The upper part of the subsoil, from a depth of 8 inches to 42 inches, is very dark gray and dark gray clay. The lower part of the subsoil from a depth of 42 inches to 80 inches is dark grayish brown, grayish brown, and pale brown clay.

Soils of minor extent include Clareville, Nusil, Papalote, and small areas of other soils. The Clareville and Papalote soils occur on similar landscapes to the Imogene soils. The Nusil soils occur on slightly higher positions than Imogene soils on stream terraces.

The major soils are used as rangeland, wildlife habitat, and pasture. The major soils are not suited to crops. The main management concerns are the hazard of water and wind erosion, and flooding hazard.

Rangeland productivity is medium for Imogene soils and high for Buchel soils. When properly managed, areas of native vegetation produce a wide variety of grasses, forbs, and browse plants for livestock and wildlife. These major soils are preferred sites for deer, are good sites for quail, and are used by dove and turkey.

The Buchel soils are not suited to urban and recreation use due to severe flooding hazard and very slow permeability. The Imogene soils are poorly suited to urban and recreational use due to very slow permeability.

13. Hindes-Mata

Very deep and deep, gently sloping to moderately steep, well drained, very gravelly and gravelly soils

This unit makes up about 3,268 acres or less than 1 percent of the county (fig. 7). It is about 34 percent Hindes soils and similar soils, 31 percent Mata soils and similar soils, and about 35 percent minor soils.

The landscape consists of hills and ridges dissected by plains in narrow valleys. The Hindes soils are mainly on summit positions on hills and ridges, and the Mata soils are mainly on shoulder slopes and upper side slopes.

The Hindes soils are very deep, well drained, and moderately slowly permeable. Typically, the surface layer is dark brown very gravelly sandy clay loam about 10 inches thick. The upper subsoil from a depth of 10 inches to 19 inches is dark reddish brown extremely gravelly clay. The middle subsoil from a depth of 19 inches to 22 inches is reddish brown very gravelly calcareous clay. The lower subsoil from a depth of 22 inches to 27 inches is brown gravelly calcareous clay. The underlying material from a depth of 27 inches to 80 inches is pink caliche with gravelly clay loam texture.

The Mata soils are deep, well drained, and moderately permeable. Typically, the surface layer is dark grayish brown gravelly clay loam about 5 inches thick. The upper subsoil from a depth of 5 inches to 31 inches is grayish brown and light brownish gray very gravelly clay loam. The lower subsoil from a depth of 31 inches to 44 inches is light gray gravelly clay loam. The underlying material from a depth of 44 inches to 56 inches is yellow weakly cemented sandstone with loam texture, and from a depth of 56 inches to 80 inches is light yellowish brown claystone with clay loam texture.

Soils of minor extent include Annarose, Sarnosa, and small areas of other soils. The Annarose soils occur on similar landscapes as the Hindes soils. The Sarnosa soils occur on side slopes below Mata soils.

The major soils are used as rangeland and wildlife habitat. This unit is not suited to cropland. The main management concerns are very low available water capacity, high content of gravel, and the water erosion hazard.

Rangeland productivity is low for Hindes soils and medium for Mata soils. When properly managed, areas of native vegetation produce a variety of grasses, forbs, and browse for livestock and wildlife. These areas are preferred sites for quail, are good sites for dove, and are used by turkey and deer.

The major soils are poorly suited or moderately suited to most urban uses and are poorly suited to most recreational uses. The amount of gravel, large stones, and slope are the main limitations. They are a potential source of caliche and gravel for use in construction.

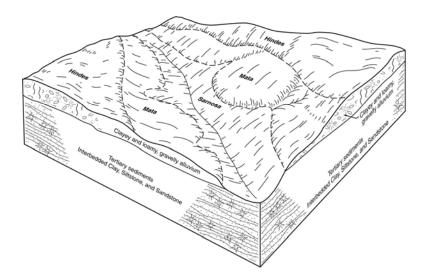


Figure 7.—Pattern of soils and underlying material in the Hindes-Mata general soil map unit.

Detailed Soil Map Units

The map units delineated on the detailed soil maps in this survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this section, along with the maps, can be used to determine the suitability and potential of a unit for specific uses. They also can be used to plan the management needed for those uses.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. The contrasting components are mentioned in the map unit descriptions. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives the principal hazards and limitations to be considered in planning for specific uses.

Soils that have profiles that are almost alike make up *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement. Composition is based on observations, descriptions, and or transects of the map unit.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Esseville gravelly clay, 1 to 5 percent slopes is a phase of the Esseville series.

This survey includes *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Pits, is an example. Table 4 gives the acreage and proportionate extent of each map unit. Other tables give properties of the soils and the limitations, capabilities, and potentials for many uses. The Glossary defines many of the terms used in describing the soils or miscellaneous areas.

AnC—Annarose fine sandy loam, 2 to 5 percent slopes

Setting

General location: Predominantly in the southwestern part of the county within the Central

Rio Grande Plain

Major land resource area: 83C

Mean annual precipitation: 22 to 28 inches (559 to 711 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 285 to 300 days

Geomorphic setting: Very gently sloping or gently sloping summits and shoulders of

ridges

Composition

Annarose and similar soils: 70 percent

Contrasting soils: 30 percent

• The Pettus soils have gravelly subsoils and are on slightly higher positions.

• The Pernitas soils are very deep and are on similar positions.

• The Weesatche soils are very deep and are in lower positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Ridge

Position on landform: Summit or shoulder

Slope: Very gently sloping or gently sloping on convex surfaces

Shape of areas: Irregular Size of areas: 10 to 250 acres

Parent material: Loamy alluvium overlying very weakly cemented sandstones in the

Oakville Sandstone of Miocene age

Typical Profile

Surface layer:

0 to 9 inches—pale brown fine sandy loam

Subsoil.

9 to 25 inches—light yellowish brown sandy clay loam

25 to 50 inches—very pale brown sandy clay loam and fine sandy loam

Underlying material:

50 to 80 inches—very pale brown, noncemented sandstone

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—50 inches Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Low

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 7.0 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Moderate Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Gray Sandy Loam

Typical vegetation: Native woody species include guajillo, mountain laurel, paloverde, mesquite, and agarito. Native grass species include twoflower and fourflower trichloris, pink pappusgrass, plains bristlegrass, hooded windmillgrass, and lovegrass tridens.

Use and Management

Major land use: Rangeland and wildlife habitat

Other land uses: Pasture

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

Moderate available water capacity limits plant growth necessary for habitat.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- Moderate available water capacity, low natural fertility, and high lime content limit growth of improved grasses during periods of drought.
- Moderate water erosion hazard exists if adequate vegetative cover is not maintained.

Cropland

Major limitations:

• Moderate water erosion hazard is a limitation during cultivation.

Minor limitations:

 Moderate available water capacity, low natural fertility, and high lime content limit plant growth.

Wildlife habitat

Major limitations:

• There are no major limitations.

Minor limitations:

• Low natural fertility limits plant growth necessary for habitat.

Urban development

Major limitations:

There are no major limitations.

Minor limitations:

 Poor filtration and the depth to sandstone limit the use for disposal of septic tank effluent.

Recreation

Major limitations:

There are no major limitations.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Seepage limits the use for overland flow of wastewater.
- Depth to bedrock and moderate permeability restrict application and treatment of wastewater.

BcA—Buchel clay, 0 to 1 percent slopes, occasionally flooded Setting

General location: Predominantly in the central and southern part of the county within the

Nueces River flood plain Major land resource area: 83A

Mean annual precipitation: 25 to 32 inches (635 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Nearly level flood plains

Composition

Buchel and similar soils: 85 percent Contrasting soils: 15 percent

- The loamy Sinton soils are on similar positions.
- The loamy Odem soils are on higher positions.

Soil Description

Landscape: Meander belt Landform: Flood plain

Position on landform: Not specified Slope: Nearly level on plane surfaces Shape of areas: Long and broad Size of areas: 20 to 1,000 acres

Parent material: Calcareous, clayey alluvium of Quaternary age

Typical Profile

Surface layer:

0 to 8 inches—very dark gray clay

Subsoil:

8 to 42 inches—very dark gray and dark gray clay

42 to 74 inches—dark grayish brown and grayish brown clay 74 to 80 inches—pale brown clay

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.6 inches (high)

Natural drainage class: Moderately well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: Occasional Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3w

Land capability irrigated: None specified Ecological site name: Clayey Bottomland

Typical vegetation: Native woody species include live oak, hackberry, elm, and pecan. Native grass species include trichloris, southwestern bristlegrass, vine mesquite, and

buffalograss.

Use and Management

Major land use: Cropland

Other land uses: Pasture, rangeland, and wildlife habitat (fig. 8)

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

Flooding hazard may briefly disrupt livestock grazing.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- Flooding hazard may briefly disrupt livestock grazing.
- Clayey texture and wetness limit the use of farm equipment following flooding.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

Clayey texture and wetness limit the use of farm equipment following flooding.



Figure 8.—Cedar elm and live oak growing adjacent to an old channel in an area of Buchel clay, 0 to 1 percent slopes, occasionally flooded.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

- Clayey surface texture, drainage, and occasional flooding limit the use for openland wildlife habitat.
- Occasional flooding limits the use for openland wildlife habitat.

Urban development

Major limitations:

- This soil is not suited to most urban uses because of flooding hazard, very slow permeability, clayey texture, and high shrink-swell potential.
- High shrink-swell potential, low strength, and flooding hazard limit the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Minor limitations:

- Flooding hazard and the clayey texture limit the use for shallow excavations.
- Flooding hazard limits the use for lawns.

Recreation

Major limitations:

- Severe flooding hazard limits the use for campsite areas and playgrounds.
- Clayey texture limits the use for golf course fairways.

Minor limitations:

- Very slow permeability and clayey surface texture limit the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for paths and trails.

Agricultural waste management

Major limitations:

Flooding hazard and very slow permeability may promote wet conditions and limit the application of waste material.

Minor limitations:

- Occasional flooding and runoff restrict this soil for application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

BfA—Buchel clay, 0 to 1 percent slopes, frequently flooded

Setting

General location: Predominantly in the central and southern part of the county along the

Nueces River flood plain Major land resource area: 83A

Mean annual precipitation: 25 to 32 inches (635 to 813 millimeters) Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Nearly level flood plains

Composition

Buchel and similar soils: 90 percent Contrasting soils: 10 percent

- The loamy Sinton soils are on similar positions. The loamy Odem soils are on higher positions.
 - Soil Description

Landscape: Meander belt Landform: Flood plain

Position on landform: Not specified Slope: Nearly level on plane surfaces Shape of areas: Long and narrow

Size of areas: 40 to 200 acres

Parent material: Calcareous, clayey alluvium of Quaternary age

Typical Profile

Surface layer:

0 to 14 inches—very dark gray clay

Subsoil:

14 to 80 inches—dark gray clay

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.6 inches (high)

Natural drainage class: Moderately well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: Frequent Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 5w

Land capability irrigated: None specified Ecological site name: Clayey Bottomland

Typical vegetation: Native woody species include live oak, hackberry, elm, and pecan. Native grass species include trichloris, southwestern bristlegrass, vine mesquite, and

buffalograss.

Use and Management

Major land use: Rangeland Other land uses: Wildlife habitat

Management Concerns

Rangeland

Major limitations:

 Frequent flooding and clayey texture of the soil affect plant growth necessary for production.

Minor limitations:

Frequent flooding limits livestock access for brief periods in some years.

Pasture

Major limitations:

• Frequent flooding and the clayey texture of the soil affect plant growth necessary for production.

Minor limitations:

Frequent flooding limits livestock and machine access for brief periods in some years.

Cropland

Major limitations:

• This soil is not suited to cropland because of flooding hazard.

Wildlife habitat

Major limitations:

Frequent flooding limits the use for openland wildlife habitat.

Urban development

Major limitations:

- This soil is not suited to most urban uses due to the frequent flooding, low strength, clayey texture, and high shrink-swell potential.
- Potential for sloughing severely restricts shallow excavations.
- Flooding hazard and clay content may promote wet conditions which restrict use for lawns and landscaping.

Recreation

Major limitations:

 Severe flooding hazard limits the use for camp areas, playgrounds, and golf course fairways.

Minor limitations:

- Flooding hazard limits the use for paths and trails.
- Very slow permeability and clayey surface texture limit the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

 Flooding hazard and very slow permeability may promote wet conditions and limit the application of waste material.

Minor limitations:

- Runoff restricts the use for application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

CaB—Campbellton clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the north central part of the county within the Northern

Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 23 to 30 inches (584 to 762 millimeters) Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 260 to 290 days

Geomorphic setting: Very gently sloping toeslopes on stream terraces

Composition

Campbellton and similar soils: 70 percent

- The clayey Esseville soils are on slightly higher positions.
- The Laparita soils are underlain by weakly cemented sandstone and are on slightly higher positions.
- The Schattel soils are very deep, nonsaline and are on knolls.

Contrasting soils: 30 percent

The Fashing soils are shallow and are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Low stream terraces

Position on landform: Toeslope on ridge or interfluve, tread on terrace

Slope: Very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 400 acres

Parent material: Calcareous, loamy alluvium, possibly overlying shales (estuarine

sediments) in the Whitsett Formation (Jackson Group) of Eocene age

Typical Profile

Surface layer:

0 to 7 inches—dark grayish brown clay loam

Subsoil:

7 to 34 inches—grayish brown and pale brown clay 34 to 43 inches—light gray clay

Underlying material:

43 to 80 inches—pale olive clay and olive claystone with texture of clay

Properties and Qualities

Percent of area covered by surface fragments: None present Depth to restrictive feature: Bedrock (densic)—43 inches Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: Medium

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 6.3 inches (moderate)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 2e Land capability irrigated: 2e

Ecological site name: Saline Clay Loam

Typical vegetation: Native woody species include blackbrush, Carolina wolfberry, granjeno, guajillo, vine ephedra, and mesquite. Native grass species include trichloris, pink pappusgrass, plains bristlegrass, plains lovegrass, and pinhole bluestem.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Maior limitations:

There are no major limitations.

Minor limitations:

Moderate available water capacity limits the production during dry seasons.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- Moderate available water capacity, salinity in the subsoil, and medium natural fertility limit forage production.
- Slight water erosion hazard exists during cultivation prior to establishing improved grasses.

Cropland

Major limitations:

· There are no major limitations.

Minor limitations:

 Moderate available water capacity, salinity in the subsoil, and medium natural fertility limit production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

 Moderate available water capacity, salinity in the subsoil, and medium natural fertility affect plant growth necessary for habitat.

Urban development

Major limitations:

- Moderately slow permeability and depth to bedrock limit disposal of septic tank effluent
- Clayey subsoil limits the development of trench type sanitary landfills.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

• There are no major limitations.

Agricultural waste management

Major limitations:

- Seepage and depth to bedrock limit the use for overland flow of wastewater.
- Very slow permeability may promote wet conditions and limit applications of wastewater.

Minor limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material.

CaC—Campbellton clay loam, 3 to 5 percent slopes

Setting

General location: Predominantly in the north central part of the county within the Northern Rio Grande Plain

Major land resource area: 83A

Moon onnual procinitation: 22:

Mean annual precipitation: 23 to 30 inches (584 to 762 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 260 to 290 days

Geomorphic setting: Gently sloping toeslopes on stream terraces

Composition

Campbellton and similar soils: 70 percent

The clayey Esseville soils are on slightly higher positions.

 The Laparita soils are underlain by weakly cemented sandstone and are on slightly higher positions.

• The Schattel soils are very deep, nonsaline and are on knolls.

Contrasting soils: 30 percent

The Fashing soils are shallow and are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Low stream terraces

Position on landform: Toeslope on ridge or interfluve, tread on terrace

Slope: Gently sloping on linear surfaces Shape of areas: Oval to irregular

Size of areas: 20 to 100 acres

Parent material: Calcareous, loamy alluvium, possibly overlying shales (estuarine

sediments) in the Whitsett Formation (Jackson Group) of Eocene age

Typical Profile

Surface layer:

0 to 9 inches—dark grayish brown clay loam

Subsoil:

9 to 22 inches—grayish brown and pale brown clay

22 to 58 inches—light gray clay

Underlying material:

58 to 80 inches—pale olive clay and olive claystone with texture of clay

Properties and Qualities

Percent of area covered by surface fragments: None present Depth to restrictive feature: Bedrock (densic)—58 inches Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: Medium
Soil reaction: Moderately alkaline
Salinity: Not saline within 40 inches
Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 8.5 inches (moderate)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3e Land capability irrigated: 3e

Ecological site name: Saline Clay Loam

Typical vegetation: Native woody species include blackbrush, Carolina wolfberry, granjeno, guajillo, vine ephedra, and mesquite. Native grass species include trichloris, pink pappusgrass, plains bristlegrass, plains lovegrass, and pinhole bluestem.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

Moderate available water capacity limits the production during dry seasons.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- Moderate available water capacity, salinity in the subsoil, and medium natural fertility limit forage production.
- Severe water erosion hazard exists during cultivation prior to establishing improved grasses.

Cropland

Major limitations:

• The severe water erosion hazard exists during cultivation.

Minor limitations:

 Moderate available water capacity, salinity in the subsoil, and medium natural fertility limit production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

 Moderate available water capacity, salinity in the subsoil, and medium natural fertility affect plant growth necessary for habitat.

Urban development

Major limitations:

- Moderately slow permeability limits the use for disposal of septic tank effluent.
- Clayey subsoil limits the development of trench type sanitary landfills.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

There are no major limitations.

Minor limitations:

• Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

 Moderately slow permeability and depth to bedrock may promote wet conditions and limit applications of wastewater.

• Seepage limits the use for overland flow of wastewater.

Minor limitations

 Moderately slow permeability may promote wet conditions and limit the application of waste material.

CeB—Choke silty clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the north central part of the county within the Northern

and Western Rio Grande Plains Major land resource area: 83B

Mean annual precipitation: 22 to 28 inches (559 to 711 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 285 to 300 days

Geomorphic setting: Very gently sloping knobs on interfluves

Composition

Choke and similar soils: 70 percent Contrasting soils: 30 percent

- The Condido and Pavelek soils are shallow to a petrocalcic horizon and are on higher positions.
- The Eloso soils are moderately deep and are in slightly lower positions.
- The clavey Rosenbrock soils are in lower positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Knob on interfluve, or knob on ridge

Position on landform: Not specified Slope: Gently sloping on linear surfaces Shape of areas: Oval to irregular

Size of areas: Oval to Irregular Size of areas: 20 to 100 acres

Parent material: Calcareous, loamy alluvium overlying tuffaceous siltstone in the

Catahoula Formation of Miocene age

Typical Profile

Surface layer:

0 to 10 inches—dark grayish brown and very dark grayish brown silty clay loam

Subsoil:

10 to 24 inches—dark grayish brown and grayish brown silty clay loam

24 to 34 inches—light brownish gray silty clay loam

34 to 48 inches—light gray silt loam 48 to 61 inches—light gray loam

Underlving material:

61 to 80 inches—very pale brown, weakly cemented tuffaceous siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—73 inches Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Medium

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.8 inches (high)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Gray Sandy Loam

Typical vegetation: Native woody species include guajillo, mountain laurel, paloverde, desert yaupon, mesquite, and agarito. Native grass species include plains bristlegrass, hooded windmillgrass, pink pappusgrass, Arizona cottontop, and twoflower and fourflower trichloris.

Use and Management

Major land use: Cropland

Other land uses: Pasture, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

 Moderate available water capacity, salinity in the subsoil, and medium natural fertility limit forage production.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

 Moderate available water capacity, salinity in the subsoil, and medium natural fertility limit production of most crops.

Wildlife habitat

Major limitations:

• There are no major limitations.

Minor limitations:

 Moderate available water capacity, excess salinity, and medium natural soil fertility affect the plant growth necessary for habitat.

Urban development

Major limitations:

Low strength limits the use for construction of local roads and streets.

Minor limitations:

- Poor filtration limits the use for disposal of septic tank effluent.
- Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

There are no major limitations.

Agricultural waste management

Major limitations:

- Seepage limits the use for overland flow of wastewater.
- Moderate permeability may promote wet conditions and limit applications of wastewater.

CeC—Choke silty clay loam, 3 to 5 percent slopes

Setting

General location: Predominantly in the north central part of the county within the Northern

and Western Rio Grande Plains Major land resource area: 83B

Mean annual precipitation: 22 to 28 inches (559 to 711 millimeters) Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 285 to 300 days

Geomorphic setting: Gently sloping knobs on interfluves

Composition

Choke and similar soils: 70 percent Contrasting soils: 30 percent

- The Eloso soils are moderately deep and are in slightly lower positions.
- The Pavelek soils are shallow and are on higher positions.
- The clayey Rosenbrock soils are in lower positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Knob on interfluve, or knob on ridge

Position on landform: Not specified

Slope: Very gently sloping on convex surfaces

Shape of areas: Oval

Size of areas: 10 to 400 acres

Parent material: Calcareous, loamy alluvium overlying tuffaceous siltstone in the

Catahoula Formation of Miocene age

Typical Profile

Surface layer:

0 to 11 inches—dark grayish brown silty clay loam

Subsoil:

11 to 37 inches—grayish brown and pale brown silty clay loam

37 to 61 inches—light gray silty clay loam

Underlying material:

61 to 80 inches—white, weakly cemented siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—54 inches Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Medium

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.7 inches (high)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 4e

Land capability irrigated: None specified Ecological site name: Gray Sandy Loam

Typical vegetation: Native woody species include guajillo, mountain laurel, paloverde, desert yaupon, mesquite, and agarito. Native grass species include plains bristlegrass, hooded windmillgrass, pink pappusgrass, Arizona cottontop, and

twoflower and fourflower trichloris.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

Due to the severe water erosion hazard, conservation measures are needed.

Minor limitations:

• High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

· There are no major limitations.

Urban development

Major limitations:

• Low strength limits the use for construction of local roads and streets.

Minor limitations:

- Poor filtration and depth to bedrock limit disposal of septic tank effluent.
- Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

There are no major limitations.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Moderate permeability and depth to bedrock may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

CkA—Clareville sandy clay loam, 0 to 1 percent slopes

Setting

General location: Predominantly in the southeastern part of the county within the

Northern Rio Grande Plain Major land resource area: 83A

Mean annual precipitation: 25 to 34 inches (635 to 864 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 250 to 300 days

Geomorphic setting: Nearly level stream terraces

Composition

Clareville and similar soils: 70 percent

The Coy soils are calcareous throughout and are in slightly lower positions.

Contrasting soils: 30 percent

- The loamy Pernitas soils are on higher positions.
- The loamy Weesatche soils are on slightly higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Stream terrace

Position on landform: Not specified Slope: Nearly level on plane surfaces Shape of areas: Long and narrow Size of areas: 20 to 100 acres

Parent material: Loamy alluvium of Quaternary age

Typical Profile

Surface layer:

0 to 12 inches—very dark gray sandy clay loam

Subsoil:

12 to 21 inches—very dark gray sandy clay

21 to 28 inches—very dark grayish brown sandy clay loam

28 to 59 inches—brown sandy clay loam

59 to 80 inches—brownish yellow, calcareous sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.5 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 2c

Land capability irrigated: None specified

Ecological site name: Clay Loam

Typical vegetation: Native woody species include Carolina wolfberry, desert yaupon, granjeno, vine ephedra, and mesquite. Native grass species include trichloris, Arizona cottontop, plains lovegrass, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

 High lime content in the subsoil limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

• High lime content in the subsoil limits the production of most crops.

Wildlife habitat

Major limitations:

• There are no major limitations.

Urban development

Major limitations:

- Moderately slow permeability limits the use for the disposal of septic tank effluent.
- · High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.

Recreation

Major limitations:

• There are no major limitations.

Agricultural waste management

Major limitations:

- Seepage limits the use for overland flow of wastewater.
- Moderately slow permeability may promote wet conditions and limit applications of wastewater.

Minor limitations:

- Moderately slow permeability may promote wet conditions and limit the application of waste material.
- Level topography limits overland flow of wastewater.

CkB—Clareville sandy clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the southeastern part of the county within the

Northern Rio Grande Plain Major land resource area: 83A

Mean annual precipitation: 25 to 34 inches (635 to 864 millimeters) Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 250 to 300 days

Geomorphic setting: Very gently sloping draws

Composition

Clareville and similar soils: 70 percent

• The Coy soils are calcareous throughout and are in slightly lower positions.

Contrasting soils: 30 percent

- The loamy Pernitas soils are on higher positions.
- The loamy Weesatche soils are on slightly higher positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Draw

Position on landform: Side slope

Slope: Very gently sloping on plane surfaces

Shape of areas: Long and narrow Size of areas: 10 to 100 acres

Parent material: Loamy alluvium and (to a lesser extent) slope alluvium of Quaternary

age

Typical Profile

Surface layer:

0 to 11 inches—very dark gray sandy clay loam

Subsoil:

11 to 45 inches—very dark gray clay loam 45 to 70 inches—dark gray sandy clay loam

70 to 80 inches—dark grayish brown sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.6 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 2e

Land capability irrigated: None specified

Ecological site name: Clay Loam

Typical vegetation: Native woody species include Carolina wolfberry, desert yaupon, granjeno, vine ephedra, and mesquite. Native grass species include trichloris, Arizona settentar, plains levegrass, and brieflagrass.

cottontop, plains lovegrass, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

 High lime content in the subsoil limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

High lime content in the subsoil limits the production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Urban development

Major limitations:

- Moderately slow permeability limits the use for disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

• Clayey texture limits the use for trench type sanitary landfills.

Recreation

Major limitations:

There are no major limitations.

Agricultural waste management

Major limitations:

- Seepage limits the use for overland flow of wastewater.
- Moderately slow permeability may promote wet conditions and limit applications of wastewater.

Minor limitations:

 Moderately slow permeability may promote wet conditions and limit the application of waste material.

CnA—Condido clay, 0 to 2 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio

Grande Plain

Major land resource area: 83A

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Nearly level or very gently sloping summits on low ridges

Composition

Condido and similar soils: 70 percent

 The Pavelek soils have petrocalcic fragments in the subsoil and are on slightly higher positions.

Contrasting soils: 30 percent

The Eloso soils are moderately deep and are in slightly lower positions.

The Rosenbrock soils are deep and are in lower positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Low ridge or structural bench on ridge

Position on landform: Summit on ridge

Slope: Nearly level and very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 200 acres

Parent material: Clayey alluvium overlying weakly cemented siltstone in the Catahoula

Formation of Miocene age

Typical Profile

Surface layer:

0 to 6 inches—very dark gray clay

Subsurface layer:

6 to 13 inches—black clay

13 to 16 inches—black gravelly clay

Underlying material:

16 to 28 inches—white, strongly cemented caliche

28 to 80 inches—very pale brown, noncemented siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: None present

Depth to restrictive feature: Petrocalcic—16 inches

Bedrock (densic): 28 inches

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Neutral to slightly alkaline Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 2.4 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: High in the soil; low in the caliche layer and underlying material

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Shallow Ridge

Typical vegetation: Native woody species include guajillo, elbowbush, mescalbean, vine ephedra, and Texas kidneywood. Native grass species include Arizona cottontop, pinhole bluestem, plains bristlegrass, and sideoats grama.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

· There are no major limitations.

Minor limitations:

• Very low available water capacity and shallow root zone limit production.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

 Very low available water capacity and the shallow root zone limit forage production during dry seasons.

Cropland

Major limitations:

- Very low available water capacity and shallow root zone limit production of most crops during dry seasons.
- Due to the severe erosion hazard, conservation measures are needed.

Wildlife habitat

Major limitations:

- Very low available water capacity and shallow rooting depth limit plant growth for wildlife habitat.
- Clayey surface texture limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Shallow depth to a cemented layer limits the use for septic tank absorption fields, lawns, and shallow excavations.
- Depth to bedrock limits the use for septic tank adsorption fields.
- High shrink-swell potential limits the use for structures and roads.
- Low strength and shallow depth to a cemented layer limit the use for construction of local roads and streets.
- Clayey texture and high carbonate content limit the use for trench type sanitary landfills, lawns, and landscaping.

Minor limitations:

 Shallow depth to a cemented layer limits the use for structures and trench type sanitary landfills.

Recreation

Major limitations:

- Shallow depth to a cemented layer limits the use for camp areas, picnic areas, and playgrounds.
- Shallow depth to a cemented layer, clayey surface texture, and high content of carbonates limit the use for golf course fairways.

Minor limitations:

- Very slow permeability and clayey surface texture limit the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for paths and trails.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Depth to a cemented pan limits the use for application and treatment of waste materials.
- Droughtiness limits plant growth and restricts the application and treatment of waste materials.
- Shallow depth to bedrock restricts the use for some applications of wastewater.

CoB—Conquista clay, 1 to 3 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Very gently sloping reclaimed mine spoil

Composition

Conquista and similar soils: 85 percent

Contrasting soils: 15 percent

- The Eloso soils are moderately deep and are in slightly lower positions.
- The clayey Monteola soils are very deep and are in lower positions.
 The Pavelek soils are shallow and are on higher positions.
- The Pavelet soils are shallow and are on higher positions.
- The Sancajo soils are shallow and are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Reclaimed land

Position on landform: Not specified

Slope: Very gently sloping on linear surfaces

Shape of areas: Rectangular Size of areas: 10 to 100 acres Parent material: Mine spoil

Typical Profile

Surface layer:

0 to 13 inches—very dark gray clay

Underlying material:

13 to 80 inches—pale olive, gravelly loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: Low

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 6.4 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: High in surface layer; low in underlying material

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 4e

Land capability irrigated: None specified Ecological site name: Not specified Typical vegetation: Not specified

Use and Management

Major land use: Pasture Other land uses: None

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Minor limitations:

- Due to the severe water erosion hazard, conservation measures are needed.
- Low natural fertility and moderate available water capacity limit forage production.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- Due to the severe water erosion hazard, conservation measures are needed.
- Clayey surface texture limits the selection of best-adapted plant species.
- Low natural fertility and moderate available water capacity limit forage production.

Cropland

Major limitations:

• Due to the severe erosion hazard, conservation measures are needed.

Minor limitations:

- High lime content limits the production of most crops.
- Low natural fertility and moderate available water capacity limits forage production.
- Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Maior limitations:

- Thickness of soil useful to crops and low natural fertility for plant growth limit the use for openland wildlife habitat.
- Clayey surface texture and very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

Very slow permeability limits the use for disposal of septic tank effluent.

Recreation

Major limitations:

Clayey surface texture limits the use for lawns, landscaping, and golf course fairways.

Minor limitations:

- Clayey surface texture and very slow permeability limit the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for paths and trails.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste materials and wastewater.

Minor limitations:

• Runoff restricts the use for application and treatment of waste materials.

CoG—Conquista clay, 20 to 40 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio

Grande Plain

Major land resource area: 83A

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Steep reclaimed mine spoil

Composition

Conquista and similar soils: 85 percent

Contrasting soils: 15 percent

- The Pavelek soils are shallow and are on higher positions.
- The map units of Water and Pits are adjacent to the Conquista soils.

Soil Description

Landscape: Rolling coastal plain Landform: Reclaimed land

Position on landform: Not specified

Slope: Steep; linear surfaces Shape of areas: Oval

Size of areas: 10 to 100 acres Parent material: Mine spoil

Typical Profile

Surface layer:

0 to 18 inches—very dark gray clay

Underlying material:

18 to 80 inches—light reddish brown and pale olive, gravelly sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: Low

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 6.8 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: High in surface layer; low in underlying material

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 7e

Land capability irrigated: None specified Ecological site name: Not specified Typical vegetation: Not specified

Use and Management

Major land use: Pasture

Other land uses: Rangeland and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

 Severe water erosion is a concern unless an adequate cover of vegetation is maintained.

Pasture

Major limitations:

• Due to the severe water erosion hazard, conservation measures are needed.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

- Low natural fertility limits forage production.
- Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

- Thickness of soil useful to crops and low natural fertility for plant growth limit the use for openland wildlife habitat.
- Clayey surface texture and very slow permeability limit this soil as rangeland wildlife habitat.

CtB—Cotulia clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the central and southwestern part of the county within

the Central Rio Grande Plain Major land resource area: 83C

Mean annual precipitation: 19 to 26 inches (483 to 660 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 260 to 300 days

Geomorphic setting: Very gently sloping footslopes on interfluves

Composition

Cotulla and similar soils: 70 percent

The Schattel soils are on higher positions.

Contrasting soils: 30 percent

- The nonsaline Danjer and Monteola soils are in slightly lower positions.
- The loamy nonsaline Pernitas soils are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge

Position on landform: Footslope or toeslope

Slope: Very gently sloping on convex to linear surfaces

Shape of areas: Irregular Size of areas: 40 to 500 acres

Parent material: Calcareous, sodic, clayey alluvium in the Oakville Sandstone and

Fleming Formation of Miocene age

Typical Profile

Surface layer:

0 to 7 inches—dark grayish brown, nonsaline clay loam

Subsoil:

7 to 12 inches—gravish brown, nonsaline clay

12 to 18 inches—light brownish gray, nonsaline clay

18 to 34 inches—light brownish gray, nonsaline sodic clay and very slightly saline sodic clay

34 to 52 inches—brown, slightly saline sodic clay

52 to 80 inches—pale brown, moderately saline sodic clay and brown, slightly saline sodic clay

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: Low

Soil reaction: Moderately alkaline

Salinity: Very slightly saline and slightly saline within 40 inches

Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 8.0 inches (moderate)

Natural drainage class: Well drained Shrink-swell potential: Very high

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 4e Land capability irrigated: 4e Ecological site name: Saline Clay

Typical vegetation: Native woody species include Texas varilla, running mesquite, upright mesquite, twisted acacia, lotebush, condalia, guayacan, and spiny hackberry. Native grass species include trichloris, vine mesquite, alkali sacaton, and whiplash pappusgrass.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

Low natural fertility limits production.

Pasture

Major limitations:

• Salinity in the root zone and low natural fertility limit forage production.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

Salinity in the root zone and low natural fertility limit potential crop production.

Minor limitations:

• High lime content limits production of most crops.

Wildlife habitat

Major limitations:

Salinity in the root zone and low natural fertility limit plant growth for wildlife habitat.

Minor limitations:

Clayey texture limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the use for disposal of septic tank effluent.
- Clayey texture and high content of sodium limit the development of trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.
- High sodium content limits the use for lawns and landscaping.

Recreation

Major limitations:

 Sodium content limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.

Minor limitations:

Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material and wastewater.
- High levels of sodium limit plant growth, severely restricting the application of waste materials and wastewater.

Minor limitations:

Runoff limits the application and treatment of waste materials.

CyA—Coy clay loam, 0 to 1 percent slopes

Setting

General location: Predominantly in the eastern part of the county within the Northern Rio

Grande Plain

Major land resource area: 83A

Mean annual precipitation: 26 to 32 inches (660 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 295 days

Geomorphic setting: Nearly level draws on interfluves

Composition

Coy and similar soils: 80 percent

- The Clareville soils are noncalcareous in the surface layer and are on low terraces.
- The clayey Monteola soils are on similar positions.

Contrasting soils: 20 percent

The loamy Pernitas soils are on higher positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Draw on interfluve or flat plain Position on landform: Not specified

Slope: Nearly level on plane surfaces Shape of areas: Long and narrow Size of areas: 20 to 400 acres

Parent material: Calcareous, clayey alluvium in the Oakville Sandstone and Fleming

Formation of Miocene age

Typical Profile

Surface layer:

0 to 11 inches—very dark gray clay loam

Subsoil.

11 to 50 inches—very dark gray and dark grayish brown clay

50 to 62 inches—brown clay

62 to 80 inches—pale brown clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Moderately alkaline Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.8 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2s Land capability irrigated: 2s

Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, condalia, and mesquite. Native grass species include trichloris, Arizona cottontop, vine mesquite,

sideoats grama, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

• There are no major limitations.

Minor limitations:

• High lime content limits production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

 The clay loam surface and very slow permeability limit the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the use for disposal of septic tank effluent.
- Clayey texture limits the development of trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.

Recreation

Major limitations:

• There are no major limitations.

Minor limitations:

Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material and wastewater.

Minor limitations:

- Runoff limits the application and treatment of waste materials.
- Level topography limits overland flow of wastewater.
- Seepage limits the use for overland flow of wastewater.

CyB—Coy clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the southeastern part of the county within the

Northern Rio Grande Plain Major land resource area: 83A

Mean annual precipitation: 26 to 32 inches (660 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 295 days

Geomorphic setting: Very gently sloping draws on interfluves

Composition

Coy and similar soils: 85 percent

• The Clareville soils are noncalcareous in the surface layer and are on low terraces.

The clayey Monteola soils are on similar positions.

• The clayey Schattel soils are on higher positions.

Contrasting soils: 15 percent

The loamy Pernitas soils are on higher positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Draw on interfluve or flat plain Position on landform: Side slope on draw Slope: Very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 300 acres

Parent material: Calcareous, clayey alluvium in the Oakville Sandstone and Fleming

Formation of Miocene age

Typical Profile

Surface layer:

0 to 6 inches—very dark gray clay loam 6 to 11 inches—very dark gray clay

Subsoil:

11 to 37 inches—very dark gray clay

37 to 61 inches—dark grayish brown and light brownish gray clay

61 to 80 inches—light gray clay

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Moderately alkaline Salinity: Not saline within 40 inches Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 9.7 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2e Land capability irrigated: 2e

Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, condalia, and mesquite. Native grass species include trichloris, Arizona cottontop, vine mesquite, sideoats grama, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

· There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

• There are no major limitations.

Minor limitations:

Clayey texture and very slow permeability limit this soil as rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the use for disposal of septic tank effluent.
- Clayey texture limits the development of trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.

Recreation

Major limitations:

• There are no major limitations.

Minor limitations:

Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material and wastewater.

Minor limitations:

- Runoff limits the application and treatment of waste materials.
- Seepage limits the use for overland flow of wastewater.

DAM—Dams

These areas consist of barriers built across a waterway to control the flow or raise the level of surface water.

DnA—Danjer clay loam, 0 to 1 percent slopes

Setting

General location: Predominantly in the southwestern part of the county within the Central

Rio Grande Plain

Major land resource area: 83C

Mean annual precipitation: 23 to 32 inches (584 to 813 millimeters)
Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 280 to 290 days

Geomorphic setting: Nearly level draws on interfluves

Composition

Danjer and similar soils: 75 percent

• The Clareville soils are noncalcareous in the surface layer and are on low terraces.

The saline and sodic Cotulla soils are on lower positions.

Contrasting soils: 25 percent

• The loamy Pernitas and Weesatche soils are on higher positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Draw on interfluve or flat plain Position on landform: Not specified Slope: Nearly level on plane surfaces Shape of areas: Long and narrow Size of areas: 20 to 250 acres

Parent material: Calcareous, clayey alluvium in the Oakville Sandstone and Fleming

Formation of Miocene age

Typical Profile

Surface layer:

0 to 10 inches—very dark gray clay loam

Subsoil

10 to 47 inches—very dark gray and very grayish brown clay

47 to 52 inches—brown clay

52 to 80 inches—pale brown clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Moderately alkaline Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.5 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2s

Land capability irrigated: None specified Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, condalia, and mesquite. Native grass species include trichloris, Arizona cottontop, vine mesquite,

sideoats grama, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

• Clayey texture and very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the use for disposal of septic tank effluent.
- Clayey texture limits the development of trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Recreation

Major limitations:

There are no major limitations.

Minor limitations:

• Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material and wastewater.

Minor limitations:

- Runoff limits the application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

DnB—Danjer clay, 1 to 3 percent slopes

Setting

General location: Predominantly in the southwestern part of the county within the Central

Rio Grande Plain

Major land resource area: 83C

Mean annual precipitation: 23 to 32 inches (584 to 813 millimeters)
Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 280 to 290 days

Geomorphic setting: Very gently sloping draws on interfluves

Composition

Danjer and similar soils: 70 percent

- The Clareville soils are noncalcareous in the surface layer and are on low terraces.
- The saline and sodic Cotulla soils are on lower positions.

Contrasting soils: 30 percent

The loamy Pernitas and Weesatche soils are on higher positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Draw on interfluve or flat plain

Position on landform: Side slope

Slope: Very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 50 to 300 acres

Parent material: Calcareous, clayey alluvium in the Oakville Sandstone and Fleming

Formation of Miocene age

Typical Profile

Surface layer:

0 to 15 inches—dark grayish brown clay

Subsoil:

15 to 45 inches—dark grayish brown and brown clay 45 to 80 inches—light brown clay and brown clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Moderately alkaline Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.4 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, condalia, and mesquite. Native grass species include trichloris, Arizona cottontop, vine mesquite,

sideoats grama, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- Due to the slight erosion hazard, conservation measures are needed.
- High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

• Clayey texture and very slow permeability limit the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the use for disposal of septic tank effluent.
- Clayey texture limits the use for developing trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Recreation

Major limitations:

There are no major limitations.

Minor limitations:

Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material and wastewater.

Minor limitations:

Runoff limits the application and treatment of waste materials.

EcB—Ecleto sandy clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the northwestern part of the county within the Western

Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 25 to 32 inches (635 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Very gently sloping summits and shoulders on ridges

Composition

Ecleto and similar soils: 85 percent

- The Fashing soils are shallow and are on similar positions.
- The Picosa soils are shallow and are on similar positions.

Contrasting soils: 15 percent

- The Campbellton soils are moderately deep and are on low terraces.
- The Laparita soils are deep and are on lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Summit or shoulder Slope: Very gently sloping on convex surfaces

Shape of areas: Oval

Size of areas: 20 to 200 acres

Parent material: Loamy residuum weathered from weakly cemented sandstones (strandplain-estuarine sediments) in the Whitsett Formation (Jackson Group) of

Eocene age

Typical Profile

Surface layer:

0 to 5 inches—brown sandy clay loam

Subsoil:

5 to 18 inches—brown and dark grayish brown clay

Underlying material:

18 to 80 inches—light brownish gray and light gray, weakly cemented sandstone

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (paralithic)—10 to 20 inches

Slowest permeability class in the soil profile: Slow

Natural soil fertility: Low

Soil reaction: Slightly acid in the surface layer; neutral in the subsoil; slightly alkaline in

underlying layer

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 3.0 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: High in the surface layer; low in the underlying material

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified

Ecological site name: Shallow

Typical vegetation: Native woody species include pricklypear, agarito, lotebush, mesquite, spiny hackberry, and live oak. Native grass species include sideoats grama, Arizona cottontop, Texas wintergrass, and pinhole bluestem.

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Use and Management

Major land use: Rangeland

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Minor limitations:

• Very low available water capacity and shallow root zone limit production.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

• Very low available water capacity and low natural fertility limit forage production.

Shallow root zone limits production.

Cropland

Major limitations:

- Very low available water capacity and low natural fertility limit yields of most crops.
- Due to the severe erosion hazard, conservation measures are needed.
- Shallow root zone limits the yields of most crops.

Wildlife habitat

Major limitations:

Shallow rooting depth and droughtiness limit plant growth for wildlife habitat.

Urban development

Major limitations:

- Depth of less than 20 inches to a cemented layer limits the development of septic tank absorption fields, sanitary landfills, local roads and streets, shallow excavations, lawns, and landscaping.
- High shrink-swell potential limits the use for structures and roads.
- Clayey texture limits the use for trench type sanitary landfills.
- Low strength limits the use for local roads and streets.

Minor limitations:

- Shallow depth to soft bedrock limits the use for structures.
- Droughtiness limits the use for lawns and landscaping.

Recreation

Major limitations:

• Depth of less than 20 inches to a cemented layer limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.

Minor limitations:

- Slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Droughtiness limits the use for golf course fairways.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Depth to bedrock limits the application and treatment of waste materials.
- Droughtiness restricts plant growth, which limits the application and treatment of waste materials.

Minor limitations:

Seepage limits the use for overland flow of wastewater.

EsA—Eloso clay, 0 to 1 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern and

Western Rio Grande Plains Major land resource area: 83A

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters)

Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Nearly level structural benches on interfluves

Composition

Eloso and similar soils: 70 percent

• The Rosenbrock soils are deep and are in slightly lower positions.

Contrasting soils: 30 percent

• The loamy Choke soils are on slightly higher positions.

The Condido and Pavelek soils are shallow and are on higher positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Structural bench on ridge or interfluve

Position on landform: Not specified Slope: Nearly level on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 200 acres

Parent material: Clayey alluvium overlying weakly cemented siltstone in the Catahoula

Formation of Miocene age

Typical Profile

Surface layer:

0 to 14 inches—very dark gray clay

Subsoil:

14 to 29 inches—dark gray clay 29 to 33 inches—grayish brown clay 33 to 37 inches—light gray silty clay loam

Underlying material:

37 to 80 inches—very pale brown, noncemented siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—37 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 6.3 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 2s

Land capability irrigated: None specified

Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, condalia, mesquite, spiny hackberry, and pricklypear. Native grass species include trichloris, Arizona cottontop, vine mesquite, sideoats grama, and bristlegrass.

Use and Management

Major land use: Rangeland

Other land uses: Cropland, pasture, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits production of most crops.

Wildlife habitat

Major limitations:

• Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

Very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability and depth to bedrock limit the disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Clayey texture limits the use for lawns and landscaping.

Recreation

Major limitations:

Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Very slow permeability and clayey surface texture limit the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for paths and trails.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Shallow depth to bedrock restricts the use for overland flow of wastewater.

Minor limitations:

- Runoff limits the application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

EsB—Eloso clay, 1 to 3 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern and

Western Rio Grande Plains Major land resource area: 83A

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Very gently sloping backslopes on interfluves

Composition

Eloso and similar soils: 70 percent

• The Rosenbrock soils are deep and are in slightly lower positions.

Contrasting soils: 30 percent

• The loamy Choke soils are on slightly higher positions. The Pavelek and Condido soils are shallow and are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge Position on landform: Backslope

Slope: Very gently sloping on complex slopes

Shape of areas: Irregular Size of areas: 20 to 200 acres

Parent material: Clayey alluvium overlying weakly cemented siltstone in the Catahoula

Formation of Miocene age

Typical Profile

Surface layer:

0 to 18 inches—very dark gray clay

Subsoil:

18 to 30 inches—light brownish gray clay

Underlying material:

30 to 80 inches—pink, noncemented siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—30 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 5.1 inches (low)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, condalia, mesquite, pricklypear, and spiny hackberry. Native grass species include trichloris,

 $\label{lem:continuous} \mbox{Arizona cottontop, vine mesquite, sideoats grama, and bristlegrass.}$

Use and Management

Major land use: Rangeland

Other land uses: Cropland, pasture, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

· There are no major limitations.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- Due to the severe water erosion hazard, conservation measures are needed.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

Due to the severe water erosion hazard, conservation measures are needed.

Minor limitations:

- High lime content limits the production of most crops.
- Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

• Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

 Salinity in the root zone and very slow permeability limit plant growth for wildlife habitat.

Urban development

Major limitations:

- Very slow permeability and depth to bedrock limit disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Clayey texture limits the use for lawns and landscaping.

Minor limitations:

 Depth to soft bedrock limits the use for structures, lawns, landscaping, and shallow excavations.

Recreation

Major limitations:

Clayey texture limits the use for golf course fairways.

Minor limitations:

- Very slow permeability and clayey texture limit the use for camp areas, picnic areas, and playgrounds.
- Clayey texture limits the use for paths and trails.
- Moderately deep depth to bedrock limits the use for golf course fairways.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Shallow depth to bedrock restricts the use for overland flow of wastewater.

Minor limitations:

 Shallow depth to densic materials and bedrock restrict the application and treatment of waste materials.

EvA—Esseville clay, 0 to 1 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern and

Western Rio Grande Plains Major land resource area: 83B

Mean annual precipitation: 22 to 28 inches (559 to 711 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 300 days

Geomorphic setting: Nearly level toeslopes on interfluves

Composition

Esseville and similar soils: 80 percent

• The Campbellton soils are moderately deep and are on low terraces.

Contrasting soils: 20 percent

- The Fashing soils are shallow and are on ridgetops.
- The Laparita soils are deep and are in slightly lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge Position on landform: Toeslope

Slope: Nearly level on plane surfaces

Shape of areas: Irregular Size of areas: 20 to 500 acres

Parent material: Saline, clayey marine sediments in the Jackson Group of Eocene age

and Frio Formation of Oligocene age

Typical Profile

Surface layer:

0 to 13 inches—very dark gray clay

Subsoil:

13 to 37 inches—dark gray and dark grayish brown clay

Underlying material:

37 to 55 inches—brown, slightly saline, noncemented claystone with texture of clay 55 to 64 inches—light yellowish brown, moderately saline, noncemented claystone with

texture of clay

64 to 80 inches—light brownish gray and pale olive, moderately saline, noncemented claystone with texture of clay

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—37 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Saline within 40 inches Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 6.7 inches (moderate)

Natural drainage class: Well drained Shrink-swell potential: Very high

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 2s

Land capability irrigated: None specified Ecological site name: Saline Clav

Typical vegetation: Native woody species include mesquite, agarito, pricklypear, and Texas varilla. Native grass species include alkali sacaton, sideoats grama, plains bristlegrass, twoflower trichloris, tobosagrass, vine mesquite, pinhole bluestem, and

buffalograss.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

• There are no major limitations.

Minor limitations:

- High lime content and salinity in the root zone limit production of most crops.
- Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

 Salinity in the root zone and very slow permeability limit plant growth for wildlife habitat.

Urban development

Major limitations:

- Very slow permeability and depth to bedrock limit disposal of septic tank effluent.
- Poor filtration limits the use for developing trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Clayey texture limits the use for trench type sanitary landfills, lawns, landscaping, and shallow excavations.
- Potential for sloughing severely restricts shallow excavations.
- High sodium content limits the use for trench type sanitary landfills, lawns, and landscaping.

Recreation

Major limitations:

- High sodium content limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Clayey surface texture and very slow permeability limit the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for paths and trails.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material.

• Moderate depth to bedrock restricts the use for some applications of wastewater.

Minor limitations:

- Runoff and high sodium content limit the application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

EvB—Esseville clay, 1 to 3 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern and

Western Rio Grande Plains Major land resource area: 83B

Mean annual precipitation: 22 to 28 inches (559 to 711 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 300 days

Geomorphic setting: Very gently sloping lower backslopes and footslopes on interfluves

Composition

Esseville and similar soils: 80 percent

• The Campbellton soils are moderately deep and are on low terraces.

Contrasting soils: 20 percent

- The Fashing soils are shallow and are on ridgetops.
- The Laparita soils are deep and are in slightly lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge

Position on landform: Footslope or lower backslope Slope: Very gently sloping on linear to concave surfaces

Shape of areas: Irregular Size of areas: 40 to 1.500 acres

Parent material: Saline, clayey marine sediments in the Jackson Group of Eocene age

and Frio Formation of Oligocene age

Typical Profile

Surface layer:

0 to 5 inches—very dark gray clay

Subsoil:

5 to 18 inches—very dark gray clay

18 to 36 inches—dark gray, slightly saline and light gray, moderately saline clay

Underlying material:

36 to 80 inches—light gray and pale yellow, moderately saline, noncemented claystone with texture of clay

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—36 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Saline within 40 inches Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 6.4 inches (moderate)

Natural drainage class: Well drained Shrink-swell potential: Very high

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 2e

Land capability irrigated: None specified Ecological site name: Saline Clay

Typical vegetation: Native woody species include mesquite, agarito, pricklypear cactus, and Texas varilla. Native grass species include alkali sacaton, sideoats grama, plains bristlegrass, twoflower trichloris, tobosagrass, vine mesquite, pinhole bluestem, and buffalograss.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

Salinity in the root zone limits forage production.

Pasture

Major limitations:

 Salinity and high lime content in the root zone limit growth of improved grasses during periods of drought.

Minor limitations:

- Clayey surface texture limits the selection of best-adapted plant species.
- Due to the severe water erosion hazard, conservation measures are needed.

Cropland

Major limitations:

- Due to the severe erosion hazard, conservation measures are needed.
- Salinity and high lime content in the root zone limit production of most crops.

Minor limitations:

Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

 Salinity in the root zone and very slow permeability limit plant growth for wildlife habitat.

Urban development

Major limitations:

- Very slow permeability and depth to bedrock limit disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.
- Clayey texture limits the use for shallow excavations, trench type sanitary landfills, lawns, and landscaping.
- High sodium content limits the use for trench type sanitary landfills, lawns, and landscaping.

Recreation

Major limitations:

- High sodium content limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Clayey surface texture and very slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for paths and trails.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- High sodium content limits plant growth severely restricting the application of waste material.
- Moderately deep depth to bedrock restricts the use for overland flow and other applications of wastewater.

Minor limitations:

High salt content limits the application and treatment of waste materials.

EvC—Esseville clay, 3 to 5 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern and Western Rio Grande Plains

Major land resource area: 83B

Mean annual precipitation: 22 to 28 inches (559 to 711 millimeters)

Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 300 days

Geomorphic setting: Gently sloping shoulders and upper backslopes on interfluves

Composition

Esseville and similar soils: 70 percent

• The Campbellton soils are moderately deep and are on low terraces.

Contrasting soils: 30 percent

The Fashing soils are shallow and are on ridgetops.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge

Position on landform: Shoulder or upper backslope

Slope: Gently sloping on convex surfaces

Shape of areas: Irregular Size of areas: 20 to 150 acres

Parent material: Saline, clayey marine sediments in the Jackson Group of Eocene age

and Frio Formation of Oligocene age

Typical Profile

Surface layer:

0 to 6 inches—very dark gray clay

Subsoil:

6 to 27 inches—very dark gray clay

Underlying material:

27 to 44 inches—very dark gray and light olive gray, moderately saline, noncemented claystone with texture of clay

44 to 80 inches—pale olive, moderately saline, noncemented claystone with texture of clay

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—27 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Saline within 40 inches Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 4.9 inches (low)

Natural drainage class: Well drained Shrink-swell potential: Very high

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified

Ecological site name: Saline Clay

Typical vegetation: Native woody species include mesquite, agarito, pricklypear, and Texas varilla. Native grass species include alkali sacaton, sideoats grama, plains

bristlegrass, twoflower trichloris, tobosagrass, vine-mesquite, pinhole bluestem, and buffalograss.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

 Salinity and high lime content in the root zone limit growth of improved grasses during periods of drought.

Minor limitations:

- Due to the severe water erosion hazard, conservation measures are needed.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

- Due to the severe erosion hazard, conservation measures are needed.
- Salinity and high lime content in the root zone limit production of most crops.

Minor limitations:

Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Maior limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

 Salinity in the root zone and very slow permeability limit plant growth for wildlife habitat.

Urban development

Major limitations:

- Very slow permeability and depth to bedrock limit disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.
- Clayey texture limits the use for shallow excavations, trench type sanitary landfills, lawns, and landscaping.
- High sodium content limits the use for trench type sanitary landfills, lawns, and landscaping.

Minor limitations:

Depth to soft bedrock limits the use for shallow excavations, lawns, and landscaping.

Recreation

Major limitations:

 High sodium content limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.

- High shrink-swell potential limits the use for structures and roads.
- Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Clayey surface texture and very slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Slope limits the use for playgrounds.
- Clayey surface texture limits the use for paths and trails.
- Depth to soft bedrock limits the use for some structures.
- Depth to bedrock limits the use for golf course fairways.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Moderately deep depth to bedrock restricts the use for overland flow and other applications of wastewater.

Minor limitations:

- Shallow depth to densic materials and bedrock restrict the application and treatment of waste materials.
- High sodium content restricts the application of wastewater.

ExC—Esseville gravelly clay, 1 to 5 percent slopes

Setting

General location: Predominantly in the northwestern part of the county within the Western

Rio Grande Plain

Major land resource area: 83B

Mean annual precipitation: 22 to 28 inches (559 to 711 millimeters)

Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 300 days

Geomorphic setting: Very gently or gently sloping shoulders and upper backslopes on

interfluves

Composition

Esseville and similar soils: 75 percent

• The Hindes soils have gravelly subsoils and are on slightly higher positions.

Contrasting soils: 25 percent

- The Campbellton soils are moderately deep and are on low terraces.
- The Fashing soils are shallow and are on ridgetops.
- The loamy Mata soils are on ridgetops.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge

Position on landform: Shoulder or upper backslope Slope: Gently sloping on linear to concave surfaces

Shape of areas: Irregular Size of areas: 40 to 500 acres

Parent material: Thin gravelly alluvium in the Uvalde Gravel of Pliocene-Pleistocene age overlying saline, clayey marine sediments in the Jackson Group of Eocene age and

Frio Formation of Oligocene age

Typical Profile

Surface layer:

0 to 8 inches—very dark gray, gravelly clay

8 to 17 inches—very dark gray, very slightly saline clay

Subsoil:

17 to 30 inches—grayish brown, slightly saline clay 30 to 37 inches—grayish brown, moderately saline clay

Underlying material:

37 to 80 inches—grayish brown and olive gray, moderately saline, noncemented claystone with texture of clay

Properties and Qualities

Percent of area covered by surface fragments: About 5 percent subangular medium and

coarse chert gravels

Depth to restrictive feature: Bedrock (densic)—37 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Saline within 40 inches Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 3.9 inches (low)

Natural drainage class: Well drained Shrink-swell potential: Very high

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Saline Clay

Typical vegetation: Native woody species include mesquite, agarito, pricklypear, and Texas varilla. Native grass species include alkali sacaton, sideoats grama, plains bristlegrass, twoflower trichloris, tobosagrass, vine-mesquite, pinhole bluestem, and

buffalograss.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

 Salinity and high lime content in the root zone limit growth of improved grasses during periods of drought.

Minor limitations:

- Due to the severe water erosion hazard, conservation measures are needed.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

- Due to the severe erosion hazard, conservation measures are needed.
- Salinity and high lime content in the root zone limit growth of improved grasses during periods of drought.

Minor limitations:

• Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

- Clayey surface texture limits the use for rangeland wildlife habitat.
- Droughtiness limits plant growth for wildlife habitat.

Minor limitations:

- Salinity in the root zone and very slow permeability limit plant growth for wildlife habitat.
- Gravelly surface limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability and depth to bedrock limit disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.
- Clayey texture limits the use for shallow excavations, trench type sanitary landfills, lawns, and landscaping.
- High sodium content limits the use for trench type sanitary landfills, lawns, and landscaping.

Recreation

Maior limitations:

- High sodium content limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- High gravel content in the surface layer limits the use for playgrounds.
- Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- High sodium content limits plant growth, severely restricting the application of waste material.
- Moderately deep depth to bedrock restricts the use for overland flow and other applications of wastewater.

Minor limitations:

• High salt content limits the application and treatment of waste materials.

FaC—Fashing clay loam, 2 to 5 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern and

Western Rio Grande Plains Major land resource area: 83B

Mean annual precipitation: 25 to 32 inches (635 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 280 to 295 days

Geomorphic setting: Very gently sloping or gently sloping summits and shoulders on

ridges

Composition

Fashing and similar soils: 75 percent Contrasting soils: 25 percent

• The Campbellton soils are moderately deep and on low terraces.

• The Esseville soils are moderately deep to claystone and in lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Summit or shoulder Slope: Gently sloping on concave surfaces

Shape of areas: Oval

Size of areas: 20 to 100 acres

Parent material: Clayey alluvium overlying weakly cemented siltstone (estuarine

sediments) in the Jackson Group of Eocene age and Frio Formation of Oligocene age

Typical Profile

Surface layer:

0 to 13 inches—dark grayish brown clay loam

Underlying material:

13 to 38 inches—light gray, calcareous, noncemented claystone and noncemented sandstone

38 to 80 inches—pale yellow, very slightly saline, noncemented claystone and noncemented sandstone

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (paralithic)—13 inches

Slowest permeability class in the soil profile: Slow

Natural soil fertility: Very low

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Very slightly saline within 40 inches

Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 1.8 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None

Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 4e Land capability irrigated: 3e Ecological site name: Shallow

Typical vegetation: Native woody species include spiny hackberry, persimmon, lotebush, mesquite, and huisache. Native grass species include sideoats grama, Arizona

cottontop, Texas wintergrass, and pinhole bluestem.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

 Very low available water capacity and low natural fertility limit production during dry seasons.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- Very low available water capacity and low natural fertility limit forage production during dry seasons.
- High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

- Very low available water capacity and low natural fertility limit production of most crops during dry seasons.
- Due to the severe erosion hazard, conservation measures are needed.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

 Shallow rooting depth and very low available water limit plant growth for wildlife habitat.

Minor limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

 Shallow depth to a cemented layer limits the use for local roads and streets, shallow excavations, lawns, and landscaping, and small commercial buildings.

- Shallow depth to bedrock limits the use for septic tank absorption fields and trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Droughtiness limits the use for lawns and landscaping.

Minor limitations:

- Depth to soft bedrock limits the use for some structures.
- Depth to a dense layer limits the use for shallow excavations.
- Clayey texture limits the use for trench type sanitary landfills.

Recreation

Major limitations:

- Shallow depth to bedrock limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- Droughtiness limits the use for golf course fairways.

Minor limitations:

- Slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Depth to bedrock and droughtiness limit plant growth and restrict the application and treatment of waste materials.
- Steep topography limits overland flow and other applications of wastewater.

GoB—Goliad fine sandy loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the central part of the county within the Northern and Central Rio Grande Plains

Major land resource area: 83A

Mean annual precipitation: 23 to 33 inches (584 to 838 millimeters)
Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 280 to 290 days

Geomorphic setting: Very gently sloping summits and shoulders on interfluves

Composition

Goliad and similar soils: 70 percent

The Lacoste and Parrita soils are shallow and are on higher positions.

Contrasting soils: 30 percent

- The Olmos soils are shallow to a petrocalcic horizon and are on higher positions.
- The loamy Pernitas and Weesatche soils are in lower positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Interfluve or ridge

Position on landform: Summit or shoulder Slope: Very gently sloping on convex surfaces

Shape of areas: Irregular Size of areas: 10 to 150 acres

Parent material: Calcareous, loamy alluvium in the Goliad Formation of Miocene-Pliocene

age

Typical Profile

Surface layer:

0 to 10 inches—brown fine sandy loam

Subsoil:

10 to 15 inches—brown sandy clay loam 15 to 36 inches—reddish brown sandy clay

Underlying material:

36 to 80 inches—white, indurated and moderately cemented caliche

Properties and Qualities

Percent of area covered by surface fragments: About 1.5 percent subangular medium and coarse petrocalcic fragments

Depth to restrictive feature: Petrocalcic—36 inches; Bedrock (paralithic)—42 inches

Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 4.1 inches (low)

Natural drainage class: Moderately well drained

Shrink-swell potential: Medium

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Sandy Loam

Typical vegetation: Native woody species include mesquite, spiny hackberry, blackbrush, guayacan, and huisache. Native grass species include feather bluestem, Arizona cottontop, plains bristlegrass, hooded windmillgrass, and trichloris.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- Low available water capacity limits forage production during dry seasons.
- High lime content limits growth of improved grasses during periods of drought.
- Due to the severe water erosion hazard, conservation measures are needed.

Cropland

Major limitations:

Due to the severe erosion hazard, conservation measures are needed.

Minor limitations:

- Low available water capacity limits production of most crops during dry seasons.
- High lime content limits production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

Low available water capacity limits plant growth for wildlife habitat.

Urban development

Major limitations:

- Moderately slow permeability, depth to a cemented layer, and depth to bedrock limit disposal of septic tank effluent.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

- Depth to a cemented layer and clayey texture limit the use for trench type sanitary landfills.
- Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

There are no major limitations.

Agricultural waste management

Major limitations:

- Seepage, depth to a cemented pan, and depth to bedrock limit the use for overland flow and other applications of wastewater.
- Moderately slow permeability may promote wet conditions and limit applications of wastewater.

Minor limitations:

- Droughtiness limits plant growth and restricts application and treatment of waste materials.
- Moderately slow permeability may promote wet conditions and limit the application of waste material.

HnD—Hindes very gravelly sandy clay loam, 3 to 8 percent slopes Setting

General location: Predominantly in the northwestern part of the county within the Western

Rio Grande Plain

Major land resource area: 83B

Mean annual precipitation: 20 to 25 inches (508 to 635 millimeters) Mean annual air temperature: 70 to 72 degrees F (21 to 22 degrees C)

Frost-free period: 240 to 280 days

Geomorphic setting: Gently sloping or moderately sloping summits and shoulders on

ridges

Composition

Hindes and similar soils: 80 percent Contrasting soils: 20 percent

- The Mata soils are calcareous throughout and are on similar positions.
- The Olmos soils are shallow to a petrocalcic horizon and are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge, interfluve, or knob

Position on landform: Summit or shoulder on ridge or interfluve Slope: Gently sloping or moderately sloping on convex surfaces

Shape of areas: Irregular Size of areas: 20 to 500 acres

Parent material: Gravelly, loamy alluvium in the Uvalde Gravel of Pliocene-Pleistocene

age

Typical Profile

Surface layer:

0 to 10 inches—dark brown, very gravelly sandy clay loam

Subsoil:

10 to 19 inches—dark reddish brown, extremely gravelly clay 19 to 22 inches—reddish brown, very gravelly calcareous clay

22 to 27 inches—brown, calcareous gravelly clay loam

Underlying material:

27 to 80 inches—pink caliche of gravelly clay loam texture

Properties and Qualities

Percent of area covered by surface fragments: About 25 percent subrounded medium and coarse indurated chert gravel

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: Low

Soil reaction: Slightly acid to slightly alkaline in the surface layer; moderately alkaline in

the underlying material

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 4.2 inches (low)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: High

Flooding frequency: None

Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Moderate Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 6s Land capability irrigated: 6s

Ecological site name: Gravelly Ridge

Typical vegetation: Native woody species include guajillo, blackbrush, and mesquite. Native grass species include tanglehead, green sprangletop, Arizona cottontop, sideoats grama, and hooded windmillgrass.

Use and Management

Major land use: Wildlife habitat Other land uses: Rangeland

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

Low available water capacity limits production during dry seasons.

Wildlife habitat

Major limitations:

- · Gravelly surface limits the use for rangeland wildlife habitat.
- Droughtiness limits plant growth for wildlife habitat.

Urban development

Major limitations:

- Potential for sloughing severely restricts shallow excavations.
- High gravel and high carbonate content limit the use for lawns and landscaping.

Minor limitations:

- Moderately slow permeability limits disposal of septic tank effluent.
- Content of large stones in the soil limits disposal of septic tank effluent.
- Slope and content of large stones in the soil limit the use for the development of trench type sanitary landfills and small commercial buildings.
- High content of large stones in the soil limits the use for structures and roads.
- Droughtiness limits the use for lawns and landscaping.

Recreation

Maior limitations:

- High content of gravel limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- Slope limits the use for playgrounds.
- High content of carbonates limits the use for golf course fairways.

Minor limitations:

Droughtiness limits the use for golf course fairways.

Agricultural waste management

Major limitations:

- Seepage limits the use for overland flow of wastewater.
- Moderately slow permeability may promote wet conditions and limit applications of wastewater.

Minor limitations:

- Moderately slow permeability may promote wet conditions and limit the application of waste material.
- Steep slopes restrict the use for disposal of wastewater by irrigation.
- High amount of cobbles restricts the use for overland flow of wastewater.

ImA—Imogene fine sandy loam, 0 to 1 percent slopes

Setting

General location: Predominantly in the northern part of the county along the Atascosa

River

Major land resource area: 83A

Mean annual precipitation: 24 to 32 inches (610 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 200 to 300 days

Geomorphic setting: Nearly level and plane low stream terraces

Composition

Imogene and similar soils: 75 percent

Contrasting soils: 25 percent

- The Buchel soils are clayey throughout and are in slightly lower flood plain positions.
- The Sinton soils are loamy throughout and are in slightly lower flood plain positions.

Soil Description

Landscape: Meander belt
Landform: Low stream terrace
Position on landform: Not specified
Slope: Nearly level on plane surfaces
Shape of areas: Long and wide to irregular

Size of areas: 30 to 600 acres

Parent material: Saline, loamy alluvium of Quaternary age

Typical Profile

Surface layer:

0 to 8 inches—dark grayish brown fine sandy loam

Subsoil:

8 to 15 inches—very dark gray sandy clay loam

15 to 36 inches—very dark gray, very slightly saline and dark grayish brown sandy clay loam

36 to 80 inches—dark grayish brown and grayish brown moderately saline sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: Low

Soil reaction: Slightly acid to slightly alkaline in the surface layer; slightly acid to strongly

alkaline in the subsoil Salinity: Saline within 40 inches Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 4.8 inches (low)

Natural drainage class: Moderately well drained

Shrink-swell potential: Moderate

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 4s Land capability irrigated: 3s

Ecological site name: Tight Sandy Loam

Typical vegetation: Native woody species include mesquite, spiny hackberry, white brush,

agarito, and blackbrush. Native grass species include hooded windmillgrass, bristlegrass, lovegrass, pink pappusgrass, sideoats grama, and Arizona cottontop.

Use and Management

Major land use: Rangeland (fig. 9)

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

- Salinity in the root zone limits forage production.
- Low available water capacity and low natural fertility limit production during dry seasons.

Pasture

Major limitations:

Salinity in the root zone limits forage production.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- Low available water capacity and low natural fertility limit forage production during dry seasons.

Cropland

Major limitations:

Salinity in the root zone limits production of most crops.

Minor limitations:

- High lime content limits production of most crops.
- Low available water capacity and low natural fertility limit production of most crops during dry seasons.



Figure 9.—An area of Imogene fine sandy loam, 0 to 1 percent slopes. The vegetation in the foreground is retama and pricklypear cactus, and in the background are mesquite trees.

Wildlife habitat

Major limitations:

- Salinity in the root zone is a limitation that affects plant growth for wildlife habitat.
- Droughtiness limits plant growth for wildlife habitat.
- Very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits disposal of septic tank effluent.
- High sodium content limits the use for trench type sanitary landfills, lawns, and landscaping.

Minor limitations:

- Moderate shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.

Recreation

Major limitations:

• High sodium content limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.

Minor limitations:

Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- High sodium content restricts the application and treatment of waste materials and wastewater.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

• High salt content restricts the application and treatment of waste materials.

Level topography limits overland flow of wastewater.

LaB—Lacoste fine sandy loam, 0 to 3 percent slopes

Setting

General location: Predominantly in the central part of the county within the Northern and

Central Rio Grande Plains Major land resource area: 83A

Mean annual precipitation: 24 to 30 inches (610 to 762 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 240 to 300 days

Geomorphic setting: Nearly level or very gently sloping summits and shoulders on

interfluves

Composition

Lacoste and similar soils: 70 percent

• The Parrita soils have clayey subsoils and are on similar positions.

Contrasting soils: 30 percent

• The Goliad soils are moderately deep and are in slightly lower positions.

- The Olmos soils are shallow to a petrocalcic horizon and are on similar positions.
- The Pettus soils have gravelly subsoils and are on similar positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge

Position on landform: Summit or shoulder

Slope: Nearly level or very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 250 acres

Parent material: Calcareous, loamy alluvium in the Goliad Formation of Miocene-Pliocene

age

Typical Profile

Surface layer:

0 to 4 inches—strong brown fine sandy loam

Subsoil.

4 to 13 inches—yellowish red and dark reddish brown sandy clay loam

Underlying material:

13 to 80 inches—very pale brown and white, strongly and moderately cemented caliche

Properties and Qualities

Percent of area covered by surface fragments: About 3 percent angular indurated petrocalcic channers

Depth to restrictive feature: Petrocalcic—13 inches; Bedrock (paralithic)—33 inches

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Low

Soil reaction: Slightly acid to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 1.8 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 4e Land capability irrigated: 3e

Ecological site name: Shallow Sandy Loam

Typical vegetation: Native woody species include elbowbush, granjeno, guajillo, guayacan, Texas kidneywood, and vine ephedra. Native grass species include tanglehead, Arizona cottontop, pink pappusgrass, plains bristlegrass, and hooded windmillgrass.

Use and Management

Major land use: Rangeland

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Minor limitations:

 Very low available water capacity and the low natural fertility limit production during dry seasons.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- Very low available water capacity and the low natural fertility limit forage production during dry seasons.
- Shallow root zone limits forage production.

Cropland

Major limitations:

- Very low available water capacity and low natural fertility limits production of most crops during dry seasons.
- Due to the severe erosion hazard, conservation measures are needed.
- Shallow root zone limits production and the type of conservation structures used.

Wildlife habitat

Major limitations:

• Droughtiness limits plant growth for wildlife habitat.

Minor limitations:

Shallow rooting depth limits plant growth for wildlife habitat.

Urban development

Major limitations:

 Shallow depth to a cemented layer limits the use for structures and roads, shallow excavations, lawns, landscaping, septic tank absorption fields, and small commercial buildings.

- Depth to bedrock limits the use for septic tank adsorption fields and trench type sanitary landfills.
- Droughtiness limits the use for lawns and landscaping.

Minor limitations:

Shallow depth to a cemented layer limits the use for trench type sanitary landfills.

Recreation

Major limitations:

- Shallow depth to a cemented pan limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- Droughtiness limits the use for golf course fairways.

Minor limitations:

Moderately deep depth to bedrock limits the use for golf course fairways.

Agricultural waste management

Major limitations:

- Depth to a cemented pan and droughtiness limits plant growth and restricts the application and treatment of waste materials.
- Shallow depth to bedrock and seepage restrict use for overland flow of wastewater.
- Moderate permeability may promote wet conditions and limit application of wastewater.

Minor limitations:

Depth to bedrock restricts the application and treatment of waste materials.

LpB—Laparita sandy clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the northwestern part of the county within the Western Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 24 to 30 inches (610 to 762 millimeters)

Mean annual air temperature: 70 to 72 degrees F (21 to 22 degrees C)

Frost-free period: 240 to 260 days

Geomorphic setting: Very gently sloping lower backslopes and footslopes on interfluves

Composition

Laparita and similar soils: 75 percent

Contrasting soils: 25 percent

- The Campbellton soils are moderately deep and are on low terraces.
- The Esseville soils are moderately deep to claystone and are in lower positions.
- The Fashing soils are shallow and are on ridgetops.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge

Position on landform: Lower backslope or footslope

Slope: Very gently sloping on linear to concave surfaces

Shape of areas: Irregular Size of areas: 40 to 500 acres

Parent material: Saline, loamy and clayey marine sediments in the Jackson Group of

Eocene age and Frio Formation of Oligocene age

Typical Profile

Surface layer:

0 to 6 inches—very dark grayish brown sandy clay loam

Subsoil.

6 to 25 inches—very dark gray and dark gray clay

25 to 42 inches—brown clay

42 to 61 inches—light yellowish brown sandy clay loam

Underlying material:

61 to 80 inches—brownish yellow, weakly cemented sandstone intermingled with soft siltstone fragments

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—56 inches Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: High

Soil reaction: Slightly acid to moderately alkaline

Salinity: Saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 8.1 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 3e Land capability irrigated: 3e

Ecological site name: Claypan Prairie

Typical vegetation: Native woody species include elbowbush, granjeno, guajillo, guayacan, Texas kidneywood, and vine ephedra. Native grass species include tanglehead, Arizona cottontop, pink pappusgrass, plains bristlegrass, and hooded windmillgrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• Salinity in the root zone limits forage production.

Pasture

Major limitations:

Salinity in the root zone limits forage production.

Cropland

Major limitations:

Salinity in the root zone limits production of most crops. Wildlife habitat

Major limitations:

Salinity in the root zone limits plant growth for wildlife habitat.

Urban development

Major limitations:

- Moderately slow permeability limits the disposal of septic tank effluent.
- Clayey texture limits the development of trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

Depth to bedrock limits the use for septic tank adsorption fields.

Recreation

Major limitations:

• There are no major limitations.

Agricultural waste management

Major limitations:

- Low adsorption ability of the soil severely restricts the application of waste materials.
- Moderately slow permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

- High salt content restricts the application and treatment of waste materials.
- High sodium content restricts the application and treatment of waste materials.
- Moderately slow permeability may promote wet conditions and limit the application of waste material.

LtA—Lattas clay, 0 to 1 percent slopes

Setting

General location: Predominantly in the southeastern part of the county within the Coast Prairie

Major land resource area: 83A

Mean annual precipitation: 23 to 30 inches (584 to 762 millimeters) Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 280 to 300 days

Geomorphic setting: Nearly level flat plains

Composition

Lattas and similar soils: 85 percent

- The Clareville soils have loamy surface layers and are on low terraces.
- The Coy soils have argillic horizons and are on slightly higher positions.

Contrasting soils: 15 percent

- The shallow Parrita soils are on higher positions.
- The Goliad soils are moderately deep to a petrocalcic horizon and are on higher positions.

Soil Description

Landscape: Flat coastal plain

Landform: Flat plain

Position on landform: Not specified Slope: Nearly level on plane surfaces

Shape of areas: Irregular Size of areas: 20 to 1,500 acres

Parent material: Clayey fluviomarine sediments in the Lissie Formation of Pleistocene

age

Typical Profile

Surface layer:

0 to 14 inches—very dark gray clay

Subsoil:

14 to 24 inches—very dark gray clay 24 to 45 inches—dark gray clay 45 to 80 inches—light gray clay

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.4 inches (high)

Natural drainage class: Moderately well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2s

Land capability irrigated: None specified

Ecological site name: Blackland

Typical vegetation: Native woody species include mesquite, spiny hackberry, huisache,

lotebush, and agarito. Native grass species include little bluestem, yellow

Indiangrass, trichloris, and sideoats grama.

Use and Management

Major land use: Cropland (fig. 10)

Other land uses: Pasture, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- High lime content limits the production of most crops.
- Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

Very slow permeability limits the use for rangeland wildlife habitat.



Figure 10.—Cotton growing on an area of Lattas clay, 0 to 1 percent slopes.

Urban development

Major limitations:

- Very slow permeability limits the disposal of septic tank effluent.
- Clayey texture limits the use for developing trench type sanitary landfills, lawns, and landscaping.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Recreation

Major limitations:

• Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Clayey texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.
- Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material.

Minor limitations:

- Runoff limits the application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

LtB—Lattas clay, 1 to 3 percent slopes

Setting

General location: Predominantly in the southeastern part of the county within the Coast Prairie

Major land resource area: 83A

Mean annual precipitation: 23 to 30 inches (584 to 762 millimeters)

Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 280 to 300 days

Geomorphic setting: Very gently sloping plains

Composition

Lattas and similar soils: 75 percent

- The Clareville soils have loamy surface layers and are on low terraces.
- The Coy soils have argillic horizons and are on slightly higher positions.

Contrasting soils: 25 percent

 The Goliad soils are moderately deep to a petrocalcic horizon and are on higher positions.

Soil Description

Landscape: Flat coastal plain Landform: Flat plain or drainageway

Position on landform: Side slope on drainageway Slope: Very gently sloping on plane surfaces

Shape of areas: Irregular

Size of areas: 20 to 100 acres

Parent material: Clayey fluviomarine sediments in the Lissie Formation of Pleistocene

age

Typical Profile

Surface layer:

0 to 6 inches—very dark gray clay

Subsurface layer:

6 to 22 inches—very dark gray clay

Subsoil:

22 to 55 inches—dark grayish brown and grayish brown clay

55 to 80 inches—brown clay

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.1 inches (high)

Natural drainage class: Moderately well drained

Shrink-swell potential: High

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified

Ecological site name: Blackland

Typical vegetation: Native woody species include mesquite, spiny hackberry, huisache,

lotebush, and agarito. Native grass species include little bluestem, yellow

Indiangrass, trichloris, and sideoats grama.

Use and Management

Major land use: Cropland

Other land uses: Pasture, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- Clayey surface texture limits the selection of best-adapted plant species.
- High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

• Very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the disposal of septic tank effluent.
- Clayey texture limits the use for developing trench type sanitary landfills, lawns, and landscaping.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Recreation

Major limitations:

Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Clayey texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.
- Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material.

Minor limitations:

Runoff limits the application and treatment of waste materials.

MaD—Mata gravelly clay loam, 3 to 8 percent slopes Setting

General location: Predominantly in the northwestern part of the county within the Western Rio Grande Plain

Major land resource area: 83B

Mean annual precipitation: 20 to 25 inches (508 to 635 millimeters) Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 250 to 300 days

Geomorphic setting: Gently sloping or moderately sloping shoulders and upper backslopes on ridges

Composition

Mata and similar soils: 75 percent

• The gravelly Esseville soils are in lower positions.

Contrasting soils: 25 percent

• The Hindes soils have gravelly clay subsoils and are on similar positions.

 The Olmos soils are shallow with caliche fragments and are on slightly higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Shoulder or upper backslope

Slope: Gently sloping or moderately sloping on convex surfaces

Shape of areas: Irregular Size of areas: 20 to 600 acres

Parent material: Gravelly, loamy alluvium in the Uvalde Gravel of Pliocene-Pleistocene age overlying clayey alluvium in the Fleming Formation of Miocene age or clayey

marine sediments in the Jackson Group of Eocene age

Typical Profile

Surface layer:

0 to 5 inches—dark grayish brown, gravelly clay loam

Subsoil:

5 to 31 inches—grayish brown and light brownish gray, very gravelly clay loam 31 to 44 inches—light gray, gravelly clay loam

Underlying material:

44 to 56 inches—yellow, weakly cemented sandstone with loam texture 56 to 80 inches—light yellowish brown, claystone with clay loam texture

Properties and Qualities

Percent of area covered by surface fragments: About 25 percent subrounded medium and coarse chert gravel

Depth to restrictive feature: Bedrock (densic)—40 to 60 inches

Slowest permeability class in the soil profile: Moderate above the bedrock

Natural soil fertility: Low

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 4.4 inches (low)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Moderate Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 6s

Land capability irrigated: None specified Ecological site name: Gravelly Ridge

Typical vegetation: Native woody species include guajillo, blackbrush, guayacan, tasajillo, and paloverde. Native grass species include tanglehead, green sprangletop, Arizona cottontop, and bristlegrass.

Use and Management

Major land use: Wildlife habitat Other land uses: Rangeland

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

 Low available water capacity and low natural fertility limit production during dry seasons.

Wildlife habitat

Major limitations:

• Droughtiness limits plant growth for wildlife habitat.

Minor limitations:

• Gravelly surface limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Depth to bedrock limits the use for trench type sanitary landfills.
- Potential for sloughing severely restricts shallow excavations.

Minor limitations:

Moderate permeability limits the use for septic tank adsorption fields.

Recreation

Major limitations:

High gravel content limits the use for playgrounds.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Low adsorption ability of the soil severely restricts the application of waste materials.
- Seepage and depth to bedrock limit the use for overland flow and other applications of wastewater.

Minor limitations:

• Droughtiness limits plant growth and restricts the application and treatment of waste materials.

MoA—Monteola clay, 0 to 1 percent slopes

Setting

General location: Predominantly in the central part of the county within the Northern Rio

Grande Plain

Major land resource area: 83A

Mean annual precipitation: 25 to 32 inches (635 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 300 days

Geomorphic setting: Nearly level and plane footslopes on interfluves

Composition

Monteola and similar soils: 80 percent

The Clareville soils have loamy surface layers and are on low terraces.

The Coy soils have argillic horizons and are on similar positions.

Contrasting soils: 20 percent

• The loamy Pernitas and Weesatche soils are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge Position on landform: Footslope Slope: Nearly level on plane surfaces

Shape of areas: Irregular Size of areas: 20 to 300 acres

Parent material: Calcareous, clayey alluvium in the Oakville Sandstone and Fleming

Formation of Miocene age

Typical Profile

Surface layer:

0 to 6 inches-very dark gray clay

Subsurface layer:

6 to 24 inches—dark gray clay

Subsoil:

24 to 54 inches—dark grayish brown and grayish brown clay 54 to 80 inches—light brownish gray, slightly saline clay

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.2 inches (high)

Natural drainage class: Moderately well drained

Shrink-swell potential: Very high

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2s Land capability irrigated: 2s

Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, condalia, and mesquite. Native grass species include trichloris, Arizona cottontop, vine mesquite, sideoats grama, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

· There are no major limitations.

Minor limitations:

- Alkaline soil reaction limits growth of improved grasses during periods of drought.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- Alkaline soil reaction limits the production of most crops.
- Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

Very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the disposal of septic tank effluent.
- Clayey texture limits the use for developing trench type sanitary landfills, lawns, and landscaping.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Minor limitations:

Clayey texture limits the use for shallow excavations.

Recreation

Major limitations:

Clayey surface texture limits the use for golf course fairways.

Minor limitations:

Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

 Clayey surface texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material.

Minor limitations:

- Runoff limits the application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

MoB—Monteola clay, 1 to 3 percent slopes

Setting

General location: Predominantly in the central part of the count within the Northern Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 25 to 32 inches (635 to 813 millimeters)

Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 300 days

Geomorphic setting: Very gently sloping lower backslopes and footslopes on interfluves

Composition

Monteola and similar soils: 75 percent

- The Clareville soils have noncalcareous loamy surface layers and are on similar positions.
- The Coy soils have argillic horizons and are on similar positions.
- The Schattel soils have light colored surface layers and are on knolls.

Contrasting soils: 25 percent

The loamy Pernitas soils are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge

Position on landform: Lower backslope or footslope Slope: Very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 40 to 200 acres

Parent material: Calcareous, clayey alluvium in the Oakville Sandstone and Fleming

Formation of Miocene age

Typical Profile

Surface layer:

0 to 17 inches—very dark gray clay

Subsoil:

17 to 54 inches—dark gray and dark grayish brown clay

54 to 70 inches—very pale brown clay

Underlying material:

70 to 80 inches—pale yellow, slightly saline clay

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.6 inches (high)

Natural drainage class: Moderately well drained

Shrink-swell potential: Very high

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3e Land capability irrigated: 3e

Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, condalia, and mesquite. Native grass species include trichloris, Arizona cottontop, vine mesquite,

sideoats grama, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

· There are no major limitations.

Minor limitations:

- Alkaline soil reaction limits growth of improved grasses during periods of drought.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- Alkaline soil reaction limits the production of most crops.
- Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

Very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the disposal of septic tank effluent.
- Clayey texture limits the use for developing trench type sanitary landfills, lawns, and landscaping.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Minor limitations:

Clayey texture limits the use for shallow excavations.

Recreation

Major limitations:

Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material.

Minor limitations:

Runoff limits the application and treatment of waste materials.

NuC—Nusil fine sand, 1 to 5 percent slopes

Setting

General location: Predominantly in the southern part of the county along the Nueces

River

Major land resource area: 83A

Mean annual precipitation: 24 to 34 inches (610 to 864 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 270 to 290 days

Geomorphic setting: Very gently sloping or gently sloping stream terraces

Composition

Nusil and similar soils: 75 percent

 The Rhymes soils have sandy surfaces more than 40 inches thick and are on similar positions.

Contrasting soils: 25 percent

The Papalote soils have clayey subsoils and are on similar positions.

Soil Description

Landscape: Meander belt Landform: Stream terrace

Position on landform: Not specified

Slope: Very gently sloping to gently sloping on convex surfaces

Shape of areas: Oval to oblong Size of areas: 40 to 500 acres

Parent material: Loamy alluvium of Quaternary age overlain by eolian sands of Holocene

age

Typical Profile

Surface layer:

0 to 29 inches—pale brown fine sand

Subsurface layer:

29 to 37 inches—very pale brown fine sand

Subsoil:

37 to 54 inches—light brownish gray and light gray sandy clay loam

54 to 70 inches—light yellowish brown sandy clay loam 70 to 80 inches—brownish yellow sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Slow

Natural soil fertility: High

Soil reaction: Slightly acid to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 5.8 inches (low)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 4e Land capability irrigated: 3e Ecological site name: Sandy

Typical vegetation: Native woody species include mesquite, live oak, and prickly pear. Native grass species include yellow Indiangrass, seacoast bluestem, hooded

windmillgrass, and tanglehead.

Use and Management

Major land use: Rangeland (fig. 11)

Other land uses: Pasture and wildlife habitat



Figure 11.—Rangeland in an area of Nusil fine sand, 1 to 5 percent slopes in the foreground. Rhymes fine sand, 1 to 5 percent slopes is in the background.

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- Low available water capacity limits forage production during dry seasons.
- Fine sand surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

• Due to the severe wind erosion hazard, conservation measures are needed.

Minor limitations:

- Low available water capacity limits production of most crops during dry seasons.
- Fine sand surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

• Droughtiness and thick sandy surface limit plant growth for wildlife habitat.

Urban development

Major limitations:

• Slow permeability limits the disposal of septic tank effluent.

- Sandy texture limits the development of trench type sanitary landfills.
- Potential for sloughing severely restricts shallow excavations.

Minor limitations:

Droughtiness limits the use for lawns and landscaping.

Recreation

Major limitations:

 Sandy texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.

Minor limitations:

- Slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Droughtiness limits the use for golf course fairways.

Agricultural waste management

Major limitations:

- Slow permeability may promote wet conditions and limit the application of waste material.
- Poor filtering capacity restricts the use for application and treatment of waste materials.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

 Sandy textures allow leaching of waste materials and potential for groundwater contamination.

OdA—Odem fine sandy loam, 0 to 1 percent slopes, occasionally flooded

Setting

General location: Predominantly in the central part of the county along the Nueces River

and its tributaries

Major land resource area: 83A

Mean annual precipitation: 23 to 35 inches (584 to 889 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 300 days

Geomorphic setting: Nearly level and plane natural levees

Composition

Odem and similar soils: 70 percent

The loamy Sinton soils are calcareous throughout and are in slightly lower positions.

Contrasting soils: 30 percent

• The clayey Buchel soils are in slightly lower positions.

Soil Description

Landscape: Meander belt Landform: Natural levee

Position on landform: Not specified Slope: Nearly level on plane surfaces

Shape of areas: Oblong Size of areas: 20 to 300 acres

Parent material: Loamy alluvium of Quaternary age

Typical Profile

Surface layer:

0 to 7 inches—dark grayish brown fine sandy loam

Subsurface layer:

7 to 24 inches—dark grayish brown fine sandy loam

Subsoil:

24 to 39 inches—pale brown fine sandy loam 39 to 80 inches—very pale brown fine sandy loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderately rapid

Natural soil fertility: High

Soil reaction: Slightly acid to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 7.8 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Negligible

Flooding frequency: Occasional with very brief duration

Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2w Land capability irrigated: 2w

Ecological site name: Loamy Bottomland

Typical vegetation: Native woody species include elm, live oak, pecan, and hackberry. Native grass species include switchgrass, trichloris, little bluestem, big sandbur,

southwestern bristlegrass, and Virginia wildrye.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

Alkaline soil reaction limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- Occasional flooding limits access for machinery for very brief periods in some years, resulting in crop loss.
- Alkaline soil reaction limits the production of most crops.

Wildlife habitat

Major limitations:

Occasional flooding may limit use for openland wildlife habitat.

Urban development

Major limitations:

- This soil is not suited to urban development because of severe flooding hazard.
- Seepage limits the disposal of septic tank effluent and trench type sanitary landfills.

Minor limitations:

Occasional flooding limits the use for lawns and landscaping.

Recreation

Major limitations:

Severe flooding hazard limits the use for camp areas.

Minor limitations:

• Occasional flooding limits the use for playgrounds and golf course fairways.

Agricultural waste management

Major limitations:

• Flooding hazard and seepage severely restrict use for overland flow of wastewater.

Minor limitations:

- Occasional flooding hazard restricts the application and treatment of waste materials and wastewater.
- Moderately slow permeability may promote wet conditions and limit applications of wastewater.
- Level topography limits overland flow of wastewater.

OmD—Olmos very gravelly sandy loam, 1 to 8 percent slopes Setting

General location: Predominantly in the central part of the county within the Northern and Central Rio Grande Plain

Major land resource area: 83C

Mean annual precipitation: 18 to 32 inches (457 to 813 millimeters)

Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 250 to 300 days

Geomorphic setting: Very gently sloping to moderately sloping summits on interfluves

Composition

Olmos and similar soils: 80 percent

• The loamy Lacoste soils are on similar positions.

Contrasting soils: 20 percent

• The loamy Pernitas soils are in lower positions.

The Pettus soils have gravelly subsoils and are on similar positions

• The Sarnosa soils are very deep and in slightly lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge Position on landform: Summit

Slope: Very gently sloping to moderately sloping on convex surfaces

Shape of areas: Irregular Size of areas: 30 to 1,500 acres

Parent material: Calcareous, loamy alluvium in the Goliad Formation of Miocene-Pliocene

age

Typical Profile

Surface layer:

0 to 8 inches—very dark grayish brown, very gravelly sandy loam

8 to 18 inches—brown, extremely gravelly sandy loam

Underlying material:

18 to 30 inches—white and very pale brown, indurated caliche

30 to 75 inches—white, weakly cemented caliche 75 to 80 inches—pink, weakly cemented caliche

Properties and Qualities

Percent of area covered by surface fragments: About 13 percent subangular petrocalcic fragments; about 2 percent angular channers of petrocalcic fragments

Depth to restrictive feature: Petrocalcic—18 inches; Bedrock (paralithic)—30 inches Slowest permeability class in the soil profile: Moderate above the petrocalcic layer, impermeable

Natural soil fertility: Low

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 1.4 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 7s

Land capability irrigated: None specified Ecological site name: Shallow Ridge

Typical vegetation: Native woody species include cenizo, guajillo, elbowbush, mescalbean, vine ephedra, and Texas kidneywood. Native grass species include Arizona cottontop, pinhole bluestem, plains bristlegrass, and sideoats grama.

Use and Management

Major land use: Rangeland (fig. 12)

Other land uses: Wildlife habitat and pasture

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

- Very low available water capacity and the low natural fertility limit production during dry seasons.
- Due to the severe water erosion hazard, conservation measures are needed.
- Depth to a hard layer of less than 10 inches limits the use of some mechanical type of range improvements.

Pasture

Major limitations:

- Due to the severe water erosion hazard, conservation measures are needed.
- Depth to a hard layer of less than 10 inches limits the use of tillage implements.

Minor limitations:

- Very low available water capacity and low natural fertility limit forage production during dry seasons.
- High lime content limits growth of improved grasses during periods of drought.
- · Shallow root zone limits production.
- High content of fragments makes it difficult to establish and maintain vegetation.

Wildlife habitat

Major limitations:

• Droughtiness limits plant growth for wildlife habitat.



Figure 12.—An area of Olmos very gravelly sandy loam, 1 to 8 percent slopes. Root plowing was done to control brush. The affect has broken up the indurated caliche layer and brought petrocalcic fragments to the surface.

- Gravelly surface limits the use for rangeland wildlife habitat.
- Shallow rooting depth limits plant growth for wildlife habitat.

Urban development

Major limitations:

- Shallow depth to a cemented layer limits the use for local roads and streets, shallow excavations, lawns, landscaping, small commercial buildings, and septic tank absorption fields.
- Shallow depth to bedrock limits the use for septic tank adsorption fields and trench type sanitary landfills.
- Potential for sloughing severely restricts shallow excavations.
- Droughtiness and the high carbonate content limit the use for lawns and landscaping.

Minor limitations:

 Shallow depth to a cemented layer limits the use for some dwellings, trench type sanitary landfills, and shallow excavations.

Recreation

Major limitations:

- Shallow depth to a cemented pan and high gravel content limit the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- Droughtiness and the high content of carbonates limit the use for golf course fairways.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Depth to a cemented pan and droughtiness limits plant growth and restricts the application and treatment of waste materials.
- Seepage limits the use for overland flow of wastewater.
- Moderate permeability and may promote wet conditions and limit applications of wastewater.

Minor limitations:

- Shallow depth to bedrock restricts the use for application and treatment of waste materials.
- Steep topography limits some applications of wastewater.

PaB—Papalote loamy fine sand, 0 to 3 percent slopes

Setting

General location: Predominantly in the southern part of the county within the Northern Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 25 to 36 inches (635 to 914 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 270 to 305 days

Geomorphic setting: Nearly level or very gently sloping relict stream terraces

Composition

Papalote and similar soils: 80 percent

Contrasting soils: 20 percent

• The Nusil and Rhymes soils have sandy surface layers more than 20 inches thick and are on similar positions.

Soil Description

Landscape: Flat coastal plain

Landform: Relict stream terrace or meander scar

Position on landform: Not specified

Slope: Nearly level and very gently sloping on complex surfaces

Shape of areas: Oval to irregular Size of areas: 20 to 500 acres

Parent material: Loamy fluviomarine sediments in the Lissie Formation of Pleistocene

age

Typical Profile

Surface layer:

0 to 12 inches—dark grayish brown loamy fine sand

Subsoil:

12 to 17 inches—gray sandy clay

17 to 36 inches—light brownish gray and strong brown sandy clay loam

36 to 60 inches—pale brown and light gray sandy clay loam 60 to 80 inches—very pale brown and white sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Slow

Natural soil fertility: Medium

Soil reaction: Moderately acid to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 8.6 inches (moderate)

Natural drainage class: Moderately well drained

Shrink-swell potential: Moderate

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Loamy Sand

Typical vegetation: Native woody species include mesquite, condalia, granjeno, huisache, and live oak. Native grass species include pink pappusgrass, plains

bristlegrass, trichloris, sideoats grama, and Arizona cottontop.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

Loamy fine sand surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

• There are no major limitations.

Minor limitations:

- Loamy fine sand surface texture limits the selection of best-adapted plant species.
- Due to the severe wind erosion hazard, conservation measures are needed.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

Loamy fine sand surface texture limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Slow permeability limits the disposal of septic tank effluent.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

• Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

 Sandy surface texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.

Minor limitations:

Slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

- Slow permeability may promote wet conditions and limit the application of waste material.
- Seepage limits the use for overland flow of wastewater.

PbA—Papalote fine sandy loam, 0 to 1 percent slopes

Setting

General location: Predominantly in the southern part of the county within the Northern Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 25 to 36 inches (635 to 914 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 270 to 305 days

Geomorphic setting: Nearly level and plane relict stream terraces

Composition

Papalote and similar soils: 70 percent

Contrasting soils: 30 percent

- The clayey Clareville soils are on similar positions.
- The loamy Weesatche soils are in slightly lower positions.

Soil Description

Landscape: Flat coastal plain

Landform: Relict stream terrace or meander scar

Position on landform: Not specified Slope: Nearly level on plane surfaces Shape of areas: Oval to irregular Size of areas: 20 to 500 acres

Parent material: Loamy fluviomarine sediments in the Lissie Formation of Pleistocene

age

Typical Profile

Surface layer:

0 to 8 inches—dark grayish brown fine sandy loam

Subsoil:

8 to 25 inches—grayish brown sandy clay

25 to 42 inches—gravish brown and brown sandy clay loam

42 to 66 inches—pale brown sandy clay loam 66 to 80 inches—very pale brown sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Slow

Natural soil fertility: Medium

Soil reaction: Moderately acid to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.1 inches (high)

Natural drainage class: Moderately well drained

Shrink-swell potential: Moderate

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2s Land capability irrigated: Specified Ecological site name: Tight Sandy Loam

Typical vegetation: Native woody species include mesquite, live oak, huisache, spiny hackberry, and prickly pear. Native grass species include pink pappusgrass, Arizona cottontop, trichloris, and plains bristlegrass.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

· There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Cropland

Major limitations:

• There are no major limitations.

Wildlife habitat

Major limitations:

• There are no major limitations.

Urban development

Major limitations:

- Slow permeability limits the disposal of septic tank effluent.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

There are no major limitations.

Minor limitations:

Slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

- Slow permeability may promote wet conditions and limit the application of waste material.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

Level topography limits overland flow of wastewater.

PbB—Papalote fine sandy loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the southern part of the county within the Northern Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 25 to 36 inches (635 to 914 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 270 to 305 days

Geomorphic setting: Very gently sloping relict stream terraces

Composition

Papalote and similar soils: 70 percent

Contrasting soils: 30 percent

- The clayey Clareville soils are on similar positions.
- The loamy Weesatche soils are in slightly lower positions.

Soil Description

Landscape: Flat coastal plain

Landform: Relict stream terrace or meander scar

Position on landform: Not specified

Slope: Very gently sloping on convex surfaces

Shape of areas: Oval to irregular Size of areas: 20 to 500 acres

Parent material: Loamy fluviomarine sediments in the Lissie Formation of Pleistocene

age

Typical Profile

Surface layer:

0 to 11 inches—brown fine sandy loam

Subsoil:

11 to 27 inches—very dark grayish brown and brown sandy clay 27 to 59 inches—pale brown and very pale brown sandy clay loam

59 to 80 inches—reddish yellow sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Slow

Natural soil fertility: Medium

Soil reaction: Moderately acid to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.1 inches (high)

Natural drainage class: Moderately well drained

Shrink-swell potential: Moderate

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2e Land capability irrigated: Specified Ecological site name: Tight Sandy Loam

Typical vegetation: Native woody species include mesquite, live oak, granjeno, prickly pear, and lantana. Native grass species include trichloris, little bluestem, tanglehead, plains bristlegrass, and pinhole bluestem.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

· There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

• There are no major limitations.

Urban development

Major limitations:

- Slow permeability limits the disposal of septic tank effluent.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

There are no major limitations.

Minor limitations:

Slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Seepage limits the use for overland flow of wastewater.

PcB—Parrita fine sandy loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the southern part of the county within the Northern

and Central Rio Grande Plains Major land resource area: 83A

Mean annual precipitation: 23 to 34 inches (584 to 864 millimeters)
Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 280 to 290 days

Geomorphic setting: Very gently sloping summits on interfluves

Composition

Parrita and similar soils: 75 percent

The loamy Lacoste soils are on similar positions.

Contrasting soils: 25 percent

- The Goliad soils are moderately deep and in lower positions.
- The Olmos soils are shallow to a petrocalcic horizon and are on slightly higher positions.
- The loamy Weesatche soils are very deep and in lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge Position on landform: Summit

Slope: Very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 200 acres

Parent material: Calcareous, loamy alluvium in the Goliad Formation of Miocene-Pliocene

age

Typical Profile

Surface layer:

0 to 5 inches—dark grayish brown fine sandy loam 5 to 11 inches—dark brown sandy clay loam

Subsoil:

11 to 19 inches—dark reddish brown sandy clay

Underlying material:

19 to 28 inches—white, indurated caliche

28 to 80 inches—white, weakly cemented caliche

Properties and Qualities

Percent of area covered by surface fragments: About 3 percent angular indurated

petrocalcic channers

Depth to restrictive feature: Petrocalcic—19 inches; Bedrock (paralithic)—28 inches

Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: Low

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 2.7 inches (very low)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Shallow Sandy Loam

Typical vegetation: Native woody species include elbowbush, granjeno, guajillo, guayacan, Texas kidneywood, and vine ephedra. Native grass species include tanglehead, Arizona cottontop, pink pappusgrass, plains bristlegrass, and hooded

windmillgrass.

Use and Management

Major land use: Rangeland

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

· There are no major limitations.

Minor limitations:

 Very low available water capacity and low natural fertility limit production during dry seasons.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- Very low available water capacity and low natural fertility limit forage production during dry seasons.
- Shallow root zone limits production.
- Due to the severe erosion hazard, conservation measures are needed.

Cropland

Major limitations:

- Very low available water capacity and low natural fertility limit production of most crops during dry seasons.
- Due to the severe erosion hazard, conservation measures are needed.
- Shallow root zone limits production and the type of conservation structures used.

Wildlife habitat

Major limitations:

Droughtiness is a limitation that affects plant growth for wildlife habitat.

Minor limitations:

• Shallow root zone limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Shallow depth to a cemented layer limits the use for lawns, landscaping, shallow excavations, septic tank absorption fields, and small commercial buildings.
- Shallow depth to bedrock limits the use for septic tank adsorption fields and trench type sanitary landfills.
- Low strength and shallow depth to a cemented pan limit construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Minor limitations:

- Moderate shrink-swell potential limits the use for structures and roads.
- Depth to soft bedrock limits the use for shallow excavations.
- Depth to a thin cemented pan and clayey texture limit the use for trench type sanitary landfills.
- Droughtiness limits the use for lawns and landscaping.

Recreation

Major limitations:

- Shallow depth to a cemented pan limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- High content of carbonates limits the use for golf course fairways.

Minor limitations:

Droughtiness limits the use for golf course fairways.

Agricultural waste management

Major limitations:

- Depth to a cemented pan and droughtiness limits plant growth and restricts the application and treatment of waste materials.
- Low adsorption ability of the soil severely restricts the application of waste materials.
- Seepage limits the use for overland flow of wastewater.
- Moderately slow permeability may promote wet conditions and limit applications of wastewater.

Minor limitations:

Shallow depth to bedrock restricts the application and treatment of waste materials.

PkB—Pavelek clay loam, 0 to 3 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio Grande Plain

Major land resource area: 83B

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters) Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Nearly level or very gently sloping summits on structural benches on ridges

Composition

Pavelek and similar soils: 70 percent

The clavey Condido soils are in similar positions.

Contrasting soils: 30 percent

The Choke soils are deep and in slightly lower positions.

- The Eloso soils are moderately deep and in lower positions.
- The Rosenbrock soils are deep and in lower positions.
- The loamy Sancajo soils are on similar positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Structural bench on ridge or narrow low ridge

Position on landform: Summit on ridge

Slope: Nearly level and very gently sloping on convex surfaces

Shape of areas: Oval to irregular Size of areas: 10 to 500 acres

Parent material: Clayey alluvium overlying weakly cemented siltstone in the Catahoula

Formation of Miocene age

Typical Profile

Surface layer:

0 to 6 inches—very dark grayish brown clay loam

Subsurface layer:

6 to 12 inches—very dark grayish brown clay

Subsoil:

12 to 16 inches—very dark grayish brown, very gravelly clay

Underlying material:

16 to 24 inches—light gray, strongly cemented caliche that is laminar in the upper part

24 to 44 inches—very pale brown, weakly cemented caliche of silt loam texture

44 to 80 inches—very pale brown, noncemented siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: About 3 percent subangular indurated petrocalcic channers, about 1 percent angular channers of indurated petrocalcic fragments

Depth to restrictive feature: Petrocalcic—16 inches; Bedrock (paralithic)—24 inches

Slowest permeability class in the soil profile: Slow

Natural soil fertility: Low

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 2.7 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Shallow Ridge *Typical vegetation:* Native woody species include guajillo, elbowbush, mescalbean, vine ephedra, Texas kidneywood. Native grass species include Arizona cottontop, pinhole bluestem, plains bristlegrass, and sideoats grama.

Use and Management

Major land use: Rangeland

Other land uses: Wildlife habitat, pasture, and cropland

Management Concerns

Rangeland

Major limitations:

· There are no major limitations.

Minor limitations:

• Very low available water capacity and shallow root zone limits production.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- Very low available water capacity and low natural fertility limit forage production during dry seasons.
- High lime content limits growth of improved grasses during periods of drought.
- Severe water erosion is a concern unless an adequate cover of vegetation is maintained.
- Shallow root zone limits production.

Cropland

Major limitations:

- Very low natural fertility limits the yield of most crops.
- Due to the severe erosion hazard, conservation measures are needed.
- Shallow root zone limits production and the type of conservation structures used.

Minor limitations:

- High lime content limits the production of most crops.
- Excess runoff limits the amount of available water for plant production.

Wildlife habitat

Major limitations:

Droughtiness limits plant growth for wildlife habitat.

Minor limitations:

- Clayey surface texture limits the use for rangeland wildlife habitat.
- Shallow rooting depth limits plant growth for wildlife habitat.

Urban development

Major limitations:

- Shallow depth to a cemented layer limits the construction of local roads and streets, shallow excavations, lawns, landscaping, small commercial buildings, and septic tank absorption fields.
- Clayey texture limits the development of trench type sanitary landfills.
- Shallow depth to bedrock limits the use for septic tank absorption fields.
- Depth to soft bedrock limits the use for shallow excavations, lawns, and landscaping.

- High carbonate content limits the use for lawns and landscaping.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

- Shallow depth to a cemented layer limits the use for dwellings and trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

- Shallow depth to a cemented layer limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- Moderately deep depth to bedrock and high content of carbonates limit the use for golf course fairways.

Minor limitations:

Slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Depth to a cemented pan and droughtiness limits plant growth and restricts the application and treatment of waste materials.
- Low adsorption ability of the soil severely restricts the application of waste materials.
- Moderately deep depth to bedrock restricts the use for overland flow and other applications of wastewater.

PkC2—Pavelek clay loam, 3 to 5 percent slopes, severely eroded Setting

General location: Predominantly in the northern part of the county within the Northern Rio Grande Plain

Major land resource area: 83B

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters)

Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Gently sloping shoulders and upper backslopes on narrow low

ridges

Composition

Pavelek severely eroded and similar soils: 70 percent

Contrasting soils: 30 percent

- The Choke soils are deep and in slightly lower positions.
- The loamy Sancajo soils are on similar positions.

Soil Description

Landscape: Rolling coastal plain Landform: Narrow. low ridge

Position on landform: Shoulder or upper backslope

Slope: Gently sloping on convex surfaces

Shape of areas: Oval to irregular Size of areas: 10 to 100 acres

Parent material: Clayey alluvium overlying weakly cemented siltstone in the Catahoula Formation of Miocene age

Typical Profile

Surface layer:

0 to 4 inches—very dark gray clay loam

Subsoil:

4 to 11 inches—very dark gray clay

Underlying material:

11 to 14 inches—white, strongly cemented caliche that is laminar in the upper part 14 to 80 inches—very pale brown, noncemented siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: About 4 percent subangular petrocalcic fragments; about 1 percent angular channers of petrocalcic fragments

Depth to restrictive feature: Petrocalcic—11 inches; Bedrock (paralithic)—14 inches

Slowest permeability class in the soil profile: Slow

Natural soil fertility: Low

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 1.7 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 6e

Land capability irrigated: None specified Ecological site name: Shallow Ridge

Typical vegetation: Native woody species include guajillo, elbowbush, mescalbean, vine ephedra, and Texas kidneywood. Native grass species include Arizona cottontop, pinhole bluestem, plains bristlegrass, and sideoats grama.

Use and Management

Major land use: Rangeland

Other land uses: Wildlife habitat and pasture

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

- Very low available water capacity and shallow root zone limits production.
- Due to the severe water erosion hazard, conservation measures are needed.

Pasture

Major limitations:

Due to the severe water erosion hazard, conservation measures are needed.

Minor limitations:

- Very low available water capacity and low natural soil fertility limit forage production during dry seasons.
- High lime content limits growth of improved grasses during periods of drought.
- Erosion has reduced the overall productivity. Further erosion is a concern unless an adequate cover of vegetation is maintained.
- Shallow root zone limits production.

Wildlife habitat

Maior limitations:

- Droughtiness limits plant growth for wildlife habitat.
- Shallow rooting depth limits plant growth for wildlife habitat.

Minor limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Shallow depth to a cemented layer limits the use for a site for local roads and streets, shallow excavations, lawns, landscaping, and septic tank absorption fields.
- Clayey texture limits the development of trench type sanitary landfills.
- Depth to soft bedrock limits the use for roads, shallow excavations, lawns, landscaping, septic tank absorption fields, and small commercial buildings.
- Low strength limits the use for construction of local roads and streets.
- Droughtiness limits the use for lawns and landscaping.

Minor limitations:

- High shrink-swell potential limits the use for structures and roads.
- Depth to a cemented pan limits the use for trench type sanitary landfills.

Recreation

Maior limitations:

- Shallow depth to a cemented pan and bedrock limit the use for camp areas, picnic areas, playgrounds, and golf course fairways.
- Droughtiness limits the use for golf course fairways.

Minor limitations:

- Slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material.
- Shallow depth to a cemented pan and bedrock restricts the application and treatment of waste materials.
- Droughtiness limits plant growth and restricts the application of waste materials.
- Moderately deep depth to bedrock restricts the use for overland flow of wastewater.

PmC—Pernitas fine sandy loam, 2 to 5 percent slopes

Setting

General location: Predominantly located in the southern part of the county within the

Northern and Central Rio Grande Plains

Major land resource area: 83C

Mean annual precipitation: 23 to 32 inches (584 to 813 millimeters)
Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 275 to 295 days

Geomorphic setting: Very gently sloping or gently sloping summits, shoulders, and upper

backslopes on ridges

Composition

Pernitas and similar soils: 70 percent

 The Weesatche soils have noncalcareous surface layers and are in slightly lower positions.

Contrasting soils: 30 percent

- The Annarose soils have lighter colored surface layers and are on slightly higher positions.
- The Clareville soils have clayey subsoils and are in lower positions.
- The Sarnosa soils are sandier and on similar positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Summit, shoulder, or upper backslope

Slope: Gently sloping on linear to convex surfaces

Shape of areas: Irregular Size of areas: 20 to 300 acres

Parent material: Calcareous, loamy alluvium in the Oakville Sandstone and Fleming Formation of Miocene age or (to a lesser extent) in the Goliad Formation of Miocene-

Pliocene age

Typical Profile

Surface layer:

0 to 7 inches—very dark grayish brown fine sandy loam

Subsoil:

7 to 20 inches—very dark grayish brown and dark brown sandy clay loam

20 to 26 inches—brown sandy clay loam 26 to 35 inches—pale brown sandy clay

35 to 58 inches—very pale brown clay loam

58 to 80 inches—very pale brown loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Medium

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.4 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: Moderate

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Moderate Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3e

Land capability irrigated: None specified Ecological site name: Gray Sandy Loam

Typical vegetation: Native woody species include mesquite, catclaw, spiny hackberry, and blackbrush. Native grass species include pink pappusgrass, hooded windmillgrass, plains bristlegrass, Arizona cottontop, and trichloris.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

· There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- Due to the moderate hazard of erosion, conservation measures are needed.
- High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Urban development

Major limitations:

Low strength limits the use for construction of local roads and streets.

Minor limitations:

- Moderate permeability limits the disposal of septic tank effluent.
- Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

• There are no major limitations.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Seepage limits the use for overland flow of wastewater.
- Moderate permeability may promote wet conditions and limit applications of wastewater.

PnB—Pernitas sandy clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the southern part of the county within the Northern

and Central Rio Grande Plains Major land resource area: 83C

Mean annual precipitation: 23 to 32 inches (584 to 813 millimeters)
Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 275 to 295 days

Geomorphic setting: Very gently sloping lower backslopes and footslopes on ridges

Composition

Pernitas and similar soils: 70 percent

 The Weesatche soils have noncalcareous surface layers and are in slightly lower positions.

Contrasting soils: 30 percent

- The Annarose soils have lighter colored surface layers and are on slightly higher positions.
- The Clareville soils have clayey subsoils and are in lower positions.
- The Coy soils have clayey subsoils and are on similar or in lower positions.
- The Sarnosa soils are sandier and on similar positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Lower backslope or footslope Slope: Very gently sloping on linear to convex surfaces

Shape of areas: Irregular Size of areas: 20 to 300 acres

Parent material: Calcareous, loamy alluvium in the Oakville Sandstone and Fleming Formation of Miocene age or (to a lesser extent) in the Goliad Formation of Miocene-Pliocene age

Typical Profile

Surface layer:

0 to 7 inches—very dark grayish brown sandy clay loam

Subsoil:

7 to 14 inches—very dark grayish brown sandy clay loam 14 to 26 inches—dark brown sandy clay loam

26 to 59 inches—strong brown clay loam 59 to 80 inches—pink loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Medium

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.4 inches (high)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 2e

Land capability irrigated: None specified Ecological site name: Gray Sandy Loam

Typical vegetation: Native woody species include mesquite, catclaw, spiny hackberry, and blackbrush. Native grass species include pink pappusgrass, plains bristlegrass, Arizona cottontop, hooded windmillgrass, and trichloris.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

· There are no major limitations.

Urban development

Major limitations:

Low strength limits the use for construction of local roads and streets.

Minor limitations:

- Moderate permeability limits the disposal of septic tank effluent.
- Moderate shrink-swell potential limits the use for structures and roads.
- Clayey texture limits the development of trench type sanitary landfills.

Recreation

Major limitations:

There are no major limitations.

Agricultural waste management

Major limitations:

- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

PtC—Pettus sandy clay loam, 2 to 5 percent slopes

Setting

General location: Predominantly in the southern part of the county within the Northern

and Central Rio Grande Plains Major land resource area: 83A

Mean annual precipitation: 23 to 33 inches (584 to 838 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 300 days

Geomorphic setting: Very gently sloping or gently sloping shoulders on interfluves

Composition

Pettus and similar soils: 75 percent Contrasting soils: 25 percent

- The Olmos soils are shallow and on similar positions.
- The Sarnosa and Pernitas soils are very deep and are in lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge Position on landform: Shoulder

Slope: Gently sloping on linear to convex surfaces

Shape of areas: Irregular Size of areas: 20 to 200 acres

Parent material: Calcareous, loamy alluvium in the Goliad Formation of Miocene-Pliocene

age

Typical Profile

Surface layer:

0 to 11 inches—dark gray, calcareous sandy clay loam

Subsoil:

11 to 54 inches—light gray, calcareous, very gravelly loam 54 to 80 inches—white, calcareous, gravelly, fine sandy loam

Properties and Qualities

Percent of area covered by surface fragments: About 2 percent subangular petrocalcic

fragments

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Low

Soil reaction: Moderately alkaline Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 3.5 inches (low)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 4e

Land capability irrigated: None specified Ecological site name: Shallow Ridge

Typical vegetation: Native woody species include cenizo, guajillo, elbowbush, mescalbean, vine ephedra, and Texas kidneywood. Native grass species include Arizona cottontop, pinhole bluestem, plains bristlegrass, and sideoats grama.

Use and Management

Major land use: Rangeland

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

• Due to the severe water erosion hazard, conservation measures are needed.

Pasture

Major limitations:

- Due to the severe water erosion hazard, conservation measures are needed.
- Low available water capacity and low natural soil fertility limit forage production during dry seasons.

Minor limitations:

• High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

- Due to the severe erosion hazard, conservation measures are needed.
- Low available water capacity and low natural soil fertility limit production of most crops during dry seasons.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

• Droughtiness limits plant growth for wildlife habitat.

Urban development

Major limitations:

- Potential for sloughing severely restricts shallow excavations.
- Droughtiness and the high carbonate content limit the use for lawns and landscaping.
- Seepage limits the use for septic tank adsorption fields and trench type sanitary landfills.

Minor limitations:

Poor filtration limits the disposal of septic tank effluent.

Recreation

Major limitations:

 Droughtiness and the high content of carbonates limit the use for golf course fairways.

Minor limitations:

Slope and high content of gravel limit the use for playgrounds.

Agricultural waste management

Major limitations:

- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

 Droughtiness limits plant growth and restricts the application and treatment of waste materials.

PvC—Picosa loam, 1 to 5 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 24 to 30 inches (610 to 762 millimeters)
Mean annual air temperature: 70 to 72 degrees F (21 to 22 degrees C)

Frost-free period: 275 to 292 days

Geomorphic setting: Very gently sloping or gently sloping summits and shoulders on ridges

Composition

Picosa and similar soils: 75 percent Contrasting soils: 25 percent

The Campbellton soils are deep and on low terraces.

• The clayey Ecleto and Fashing soils are clayey and are on similar positions.

• The Laparita soils are deep and in lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Summit or shoulder

Slope: Very gently sloping or gently sloping on convex surfaces

Shape of areas: Oval to irregular Size of areas: 10 to 200 acres

Parent material: Residuum weathered from weakly cemented, interbedded tuffaceous

sandstones and shales in the Jackson Group of Eocene age

Typical Profile

Surface layer:

0 to 6 inches—very dark gray loam

Subsoil:

6 to 11 inches—brownish yellow cobbly loam

Underlying material:

11 to 80 inches—white, noncemented, partially weathered sandstone

Properties and Qualities

Percent of area covered by surface fragments: About 1 percent angular sandstone channers

Depth to restrictive feature: Bedrock (paralithic)—11 inches

Slowest permeability class in the soil profile: Moderate above the bedrock

Natural soil fertility: Low

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 1.4 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 7s Land capability irrigated: 2s

Ecological site name: Shallow Ridge

Typical vegetation: Native woody species include mesquite, guajillo, blackbrush, lotebush, and catclaw. Native grass species include Arizona cottontop, pinhole bluestem, plains bristlegrass, and sideoats grama.

Use and Management

Major land use: Rangeland

Other land uses: Wildlife habitat, pasture, and cropland

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

- Very low available water capacity and low natural fertility limit forage production during dry seasons.
- Due to the severe erosion hazard, conservation measures are needed.
- Shallow depth to a hard layer limits use of some mechanical types of range improvements.

Pasture

Major limitations:

- Due to the severe erosion hazard, conservation measures are needed.
- Shallow depth to a hard layer limits the use of tillage implements.

Minor limitations:

- Very low available water capacity and low natural fertility limit forage production during dry seasons.
- High lime content limits growth of improved grasses during periods of drought.
- Shallow root zone limits production.

Cropland

 This soil is not suited to nonirrigated cropland due to very low available water capacity, low natural soil fertility, the severe erosion hazard, and shallow root zone.

Wildlife habitat

Major limitations:

- Droughtiness limits plant growth for wildlife habitat.
- Shallow rooting depth limits plant growth for wildlife habitat.

Urban development

Major limitations:

- Shallow depth to bedrock limits the use for septic tank absorption fields and trench type sanitary landfills.
- Shallow depth to soft bedrock limits the use for small commercial buildings, shallow excavations, lawns, landscaping, and roads.
- Droughtiness and high sodium content limit the use for lawns and landscaping.
- High salt and high sodium content limit the development of trench type sanitary landfills.

Minor limitations:

• Shallow depth to a cemented layer limits the use for structures.

Recreation

Major limitations:

• High sodium content and shallow depth to bedrock limit the use for camp areas, picnic areas, playgrounds, and golf course fairways.

• Droughtiness limits the use for golf course fairways.

Minor limitations:

High content of gravel limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Depth to bedrock and droughtiness limit plant growth and restrict the application and treatment of waste materials.
- High salt content restricts the application and treatment of waste materials.
- High sodium content restricts the application and treatment of wastewater.
- Seepage limits the use for overland flow of wastewater.
- Moderate permeability may promote wet conditions and limit applications of wastewater.

Px—Pits

Setting

General location: Predominantly in the central part of the county within the Northern and

Central Rio Grande Plain Major land resource area: 83A

Mean annual precipitation: 18 to 32 inches (457 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 250 to 300 days Geomorphic setting: Not specified

Composition

Pits and similar inclusions: 90 percent Contrasting inclusions: 10 percent

The Olmos soils are shallow and in slightly lower positions.

Soil Description

Landform: Quarry

Position on landform: Not specified Slope: Gently sloping; convex surfaces Shape of areas: Oval to irregular Size of areas: 10 to 250 acres

Parent material: Calcareous, loamy alluvium in the Goliad Formation of Miocene-Pliocene

age

Interpretive Groups

Land capability nonirrigated: 8s

Land capability irrigated: None specified

Use and Management

Major land use: Wildlife habitat

Other land uses: None

RhC—Rhymes fine sand, 1 to 5 percent slopes

Setting

General location: Predominantly in the southern part of the county along the Nueces

River

Major land resource area: 83A

Mean annual precipitation: 24 to 34 inches (610 to 864 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 270 to 290 days

Geomorphic setting: Very gently sloping or gently sloping stream terraces

Composition

Rhymes and similar soils: 75 percent

 The Nusil soils have sandy surface layers less than 40 inches thick and are on similar positions.

Contrasting soils: 25 percent

• The Papalote soils have clayey subsoils and are on similar positions.

Soil Description

Landscape: Meander belt Landform: Stream terrace

Position on landform: Not specified

Slope: Very gently sloping or gently sloping on linear to convex surfaces

Shape of areas: Oval

Size of areas: 20 to 100 acres

Parent material: Loamy alluvium of Quaternary age overlain by eolian sands of Holocene

age

Typical Profile

Surface layer:

0 to 11 inches—pale brown fine sand

Subsurface layer:

11 to 71 inches—very pale brown fine sand

Subsoil:

71 to 80 inches—strong brown sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderately slow

Natural soil fertility: Medium

Soil reaction: Moderately acid to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 4.7 inches (low) Natural drainage class: Somewhat excessively drained

Shrink-swell potential: Low

Runoff: Negligible

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 6e Land capability irrigated: 4e Ecological site name: Sandy

Typical vegetation: Native woody species include live oak, mesquite, and pricklypear. Native grass species include yellow Indiangrass, seacoast bluestem, switchgrass, and tanglehead.

Use and Management

Major land use: Rangeland

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

· There are no major limitations.

Minor limitations:

• Low available water capacity limits production during dry seasons.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- Low available water capacity limits production during dry seasons.
- Sandy surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

- This soil is not suited to nonirrigated cropland due to low available water capacity and the severe wind erosion hazard.
- Due to the severe wind erosion hazard, conservation measures are needed.

Minor limitations:

Sandy surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

- Droughtiness limits plant growth for wildlife habitat.
- Sandy soil texture limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Poor filtration limits the disposal of septic tank effluent.
- Sandy texture limits the development of trench type sanitary landfills.
- Potential for sloughing severely restricts shallow excavations.

Minor limitations:

Droughtiness limits the use for lawns and landscaping.

Recreation

Major limitations:

 Sandy texture limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.

Minor limitations:

- Slope limits the use for playgrounds.
- Droughtiness limits the use for golf course fairways.

Agricultural waste management

Major limitations:

- Poor filtering capacity restricts the application and treatment of waste materials and wastewater.
- Moderately slow permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

- Moderately slow permeability may promote wet conditions and limit the application of waste material.
- Sandy textures allow leaching of waste materials and potential for groundwater contamination.

RoA—Rosenbrock clay, 0 to 1 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters) Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Nearly level toeslopes on interfluves

Composition

Rosenbrock and similar soils: 75 percent

Contrasting soils: 25 percent

- The Choke soils have loamy subsoils and are on slightly higher positions.
- The Condido and Pavelek soils are shallow and are on higher positions.
- The Eloso soils are moderately deep and are on slightly higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge Position on landform: Toeslope Slope: Nearly level on plane surfaces Shape of areas: Oval to irregular Size of areas: 20 to 200 acres

Parent material: Clayey alluvium overlying weakly cemented tuffaceous siltstone in the

Catahoula Formation of Miocene age

Typical Profile

Surface layer:

0 to 14 inches—very dark gray clay

Subsoil:

14 to 44 inches—dark grayish brown and grayish brown, calcareous clay

44 to 59 inches—pale brown, calcareous clay

Underlying material:

59 to 80 inches—pinkish gray, noncemented siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—59 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.0 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 2c

Land capability irrigated: None specified Ecological site name: Rolling Blackland

Typical vegetation: Native woody species include blackbrush, granjeno, agarito, live oak,

and condalia. Native grass species include trichloris, Arizona cottontop, vine

mesquite, sideoats grama, and bristlegrass.

Use and Management

Major land use: Cropland

Other land uses: Pasture, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- Clayey surface texture limits the selection of best-adapted plant species.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- High lime content limits the production of most crops.
- Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations

• Very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the disposal of septic tank effluent.
- Poor filtration limits the disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.
- Clayey texture limits the use for trench type sanitary landfills, lawns, and landscaping.

Minor limitations:

Clayey texture limits the use for shallow excavations.

Recreation

Major limitations:

Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Clayey surface texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.
- Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material and wastewater.
- Depth to bedrock restricts the use for some applications of wastewater.

Minor limitations:

- Runoff limits the application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

RoB—Rosenbrock clay, 1 to 3 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters) Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Very gently sloping toeslopes on interfluves

Composition

Rosenbrock and similar soils: 70 percent

Contrasting soils: 30 percent

• The Choke soils have loamy subsoils and are on slightly higher positions.

The Condido and Pavelek soils are shallow and are on higher positions.

The Eloso soils are moderately deep and are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Interfluve or ridge Position on landform: Toeslope

Slope: Very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 200 acres

Parent material: Clayey alluvium overlying weakly cemented tuffaceous siltstone in the

Catahoula Formation of Miocene age

Typical Profile

Surface layer:

0 to 6 inches-very dark gray clay

Subsoil:

6 to 44 inches—very dark gray and very dark grayish brown clay 44 to 58 inches—grayish brown clay and clay loam

Underlying material:

58 to 80 inches—white, noncemented siltstone of silt loam texture

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—58 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.2 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Moderate Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 2e

Land capability irrigated: None specified Ecological site name: Rolling Blackland

Typical vegetation: Native woody vegetation includes blackbrush, granjeno, agarito, and condalia. Native grass species include trichloris, Arizona cottontop, vine mesquite, sideoats grama, and bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Cropland, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

· High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

• There are no major limitations.

Minor limitations:

- High lime content limits the production of most crops.
- Due to the moderate water erosion hazard, conservation measures are needed.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

Very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Very slow permeability limits the disposal of septic tank effluent.
- Poor filtration limits the disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.
- Clayey texture limits the use for trench type sanitary landfills, lawns, and landscaping.

Minor limitations:

Clayey texture limits the use for shallow excavations.

Recreation

Major limitations:

Clayey surface texture limits the use for golf course fairways.

Minor limitations:

- Clayey surface texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.
- Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.

Agricultural waste management

Major limitations:

- Very slow permeability may promote wet conditions and limit the application of waste material and wastewater.
- Depth to bedrock restricts the use for some applications of wastewater.

Minor limitations:

Runoff limits the application and treatment of waste materials.

RrA—Rosenbrock clay, 0 to 1 percent slopes, rarely flooded Setting

General location: Predominantly in the northern part of the county within in the Northern

Rio Grande Plain

Major land resource area: 83A

Mean annual precipitation: 28 to 32 inches (711 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days Geomorphic setting: Nearly level draws

Composition

Rosenbrock and similar soils: 80 percent

The Clareville soils have loamy surfaces and are on slightly higher positions.

• The Eloso soils are moderately deep and are on higher positions.

Contrasting soils: 20 percent

The loamy Choke soils are on higher positions.

The clayey Buchel soils are on flood plains.

Soil Description

Landscape: Rolling coastal plain

Landform: Draw

Position on landform: Not specified Slope: Nearly level on plane surfaces Shape of areas: Long and narrow Size of areas: 20 to 500 acres

Parent material: Clayey alluvium overlying weakly cemented tuffaceous siltstone in the

Catahoula Formation of Miocene age

Typical Profile

Surface layer:

0 to 8 inches—very dark gray clay

Subsoil:

8 to 52 inches—very dark gray and dark grayish brown, calcareous clay

52 to 59 inches—light brownish gray clay

Underlying Material:

59 to 80 inches—light gray, noncemented siltstone of loam texture and light brownish gray clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—59 inches Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.2 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: Rare Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 2w

Land capability irrigated: None specified Ecological site name: Rolling Blackland

Typical vegetation: Woody vegetation includes blackbrush, granjeno, condalia, agarito, and live oak. Native grass species include trichloris, Arizona cottontop, vine mesquite,

sideoats grama, and bristlegrass.

Use and Management

Major land use: Cropland

Other land uses: Pasture, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- Due to the severe wind erosion hazard, conservation measures are needed.
- High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

Clayey surface texture limits the use for rangeland wildlife habitat.

Minor limitations:

Very slow permeability limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- This soil is not suited to urban development because of the flooding hazard, clayey texture, high shrink-swell potential, and low soil strength.
- Clayey texture limits the development of trench type sanitary landfills and disposal of septic tank effluent.
- High shrink-swell potential limits the use for structures and roads.

- Low strength limits the use for construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.
- Clayey texture limits the use for lawns and landscaping.

Minor limitations:

- Flooding hazard limits the use for trench type sanitary landfills, local roads, and streets.
- Clayey texture limits the use for shallow excavations.

Recreation

Major limitations:

- Severe flooding hazard limits the use for camp areas.
- Clayey surface texture limits the use for golf course fairways.

Minor limitations

- Very slow permeability limits the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for camp areas, picnic areas, playgrounds, paths, and trails.

Agricultural waste management

Major limitations:

 Very slow permeability may promote wet conditions and limit the application of waste material.

Minor limitations:

- Runoff limits the application and treatment of waste materials.
- Occasional flooding hazard restricts the application and treatment of waste materials.
- Level topography limits overland flow of wastewater.

SaD—Sancajo very gravelly loam, 1 to 8 percent slopes

Setting

General location: Predominantly in the northwestern part of the county within the Western

Rio Grande Plain

Major land resource area: 83C

Mean annual precipitation: 20 to 28 inches (508 to 711 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 250 to 300 days

Geomorphic setting: Very gently sloping to moderately sloping summits and shoulders on

ridges

Composition

Sancajo and similar soils: 80 percent

Contrasting soils: 20 percent

- The Choke soils are deep and in lower positions.
- The Eloso soils are moderately deep and in lower positions.
- The Pavelek soils are clayey and are on similar positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Summit or shoulder

Slope: Very gently sloping to moderately sloping on convex surfaces

Shape of areas: Irregular

Size of areas: 50 to 1,000 acres

Parent material: Loamy, gravelly alluvium overlying weakly cemented siltstone in the

Catahoula Formation of Miocene age

Typical Profile

Surface layer:

0 to 6 inches—dark grayish brown very gravelly loam

Subsurface layer:

6 to 11 inches—dark grayish brown, extremely cobbly loam

Subsoil:

11 to 18 inches—white, indurated caliche

Underlying material:

18 to 80 inches—light gray silt loam and weakly consolidated siltstone

Properties and Qualities

Percent of area covered by surface fragments: About 10 percent subangular coarse gravel and cobbles of indurated chert, about 20 percent angular petrocalcic channers

Depth to restrictive feature: Petrocalcic—11 inches; Bedrock (densic)—18 inches

Slowest permeability class in the soil profile: Impermeable

Natural soil fertility: Low

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 0.9 inches (very low)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Very high

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 7s

Land capability irrigated: None specified Ecological site name: Shallow Ridge

Typical vegetation: Native woody species include persimmon, guajillo, cenizo, mountain laurel, paloverde, agarito, and pricklypear. Native grass species include Wright's threeawn, slim tridens, sideoats grama, plains bristlegrass, buffalograss, and plains lovegrass.

Use and Management

Major land use: Rangeland

Other land uses: Wildlife habitat and pasture

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

 Very low available water capacity and low natural soil fertility limits the production during dry seasons.

Due to the severe water erosion hazard, conservation measures are needed.

Pasture

Major limitations:

Due to the severe water erosion hazard, conservation measures are needed.

Minor limitations:

- Very low available water capacity and low natural fertility limit forage production during dry seasons.
- High lime content limits growth of improved grasses during periods of drought.
- Shallow root zone limits production.

Wildlife habitat

Major limitations:

- · Droughtiness limits plant growth for wildlife habitat.
- Shallow rooting depth limits plant growth for wildlife habitat.
- · Gravelly surface limits the use for rangeland wildlife habitat.

Urban development

Major limitations:

- Shallow depth to a cemented layer limits the use for roads, shallow excavations, lawns, landscaping, and septic tank absorption fields.
- High content of large stones limits the use for structures, shallow excavations, septic tank absorption fields, trench type sanitary landfills, and roads.
- Shallow depth to a cemented layer and soft bedrock limit the use for small commercial buildings.
- Shallow depth to soft bedrock limits the use for septic tank absorption fields, roads, shallow excavations, lawns, and landscaping.
- Droughtiness limits the use for lawns and landscaping.

Minor limitations:

- Shallow depth to a cemented layer and soft bedrock limit the use for structures.
- Shallow depth to a cemented pan limits the use for trench type sanitary landfills.

Recreation

Major limitations:

- High gravel content, shallow depth to a cemented pan and bedrock limit the use for camp areas, picnic areas, and playgrounds.
- Droughtiness and shallow depth to bedrock limit the use for golf course fairways.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Depth to bedrock and droughtiness limit plant growth and restrict the application and treatment of waste materials.
- Shallow depth to a cemented pan restricts the application and treatment of waste materials.
- Seepage limits the use for overland flow of wastewater.

 Impermeable permeability may promote wet conditions and limit applications of wastewater.

Minor limitations:

• Steep topography limits some applications of wastewater.

SeD—Sarnosa fine sandy loam, 3 to 8 percent slopes

Setting

General location: Predominantly in the southern part of the county within the Northern

and Central Rio Grande Plains Major land resource area: 83A

Mean annual precipitation: 26 to 36 inches (660 to 914 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 290 days

Geomorphic setting: Gently sloping or moderately sloping backslopes on ridges

Composition

Sarnosa and similar soils: 80 percent

 The Annarose soils have surface layer lighter in color and are on slightly higher positions.

Contrasting soils: 20 percent

- The Olmos soils are shallow and on higher positions.
- The Pernitas soils have more clay in the subsoil and are in slightly lower positions.
- The Pettus soils have gravel in the subsoil and are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve Position on landform: Backslope

Slope: Gently sloping or moderately sloping on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 500 acres

Parent material: Calcareous, loamy alluvium in the Oakville Sandstone of Miocene age or

(to a lesser extent) in the Goliad Formation of Miocene-Pliocene age

Typical Profile

Surface layer:

0 to 6 inches—very dark grayish brown fine sandy loam

Subsoil:

6 to 13 inches—very dark grayish brown sandy clay loam

13 to 34 inches—brown sandy clay loam

34 to 57 inches—pale brown and very pale brown sandy clay loam

57 to 68 inches—very pale brown fine sandy loam 68 to 80 inches—very pale brown sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Medium Soil reaction: Moderately alkaline Salinity: Not saline within 40 inches

Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 7.7 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 4e

Land capability irrigated: None specified Ecological site name: Gray Sandy Loam

Typical vegetation: Native woody species include mesquite, huisache, cenizo, and pricklypear. Native grass species include trichloris, plains bristlegrass, pink

pappusgrass, Arizona cottontop, and tanglehead.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

• Due to the severe water erosion hazard, conservation measures are needed.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

Droughtiness and slope limit rangeland wildlife habitat.

Urban development

Major limitations:

Seepage limits the disposal of septic tank effluent and trench type sanitary landfills.

Minor limitations:

- Slope limits the use for construction of some structures.
- Poor filtration in the upper part of the soil limits the disposal of septic tank effluent.

Recreation

Major limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

Steep slopes limit the disposal of wastewater by irrigation and other methods.

ShC—Schattel clay loam, 2 to 5 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio

Grande Plain

Major land resource area: 83A

Mean annual precipitation: 26 to 32 inches (660 to 813 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 265 to 295 days

Geomorphic setting: Very gently sloping or gently sloping knolls

Composition

Schattel and similar soils: 70 percent

• The Coy and Monteola soils are very deep and are in lower positions.

Contrasting soils: 30 percent

- The Campbellton soils are on low terraces.
- The Hindes soils have gravels throughout and are on higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Knoll or saddle

Position on landform: Not specified Slope: Gently sloping on convex surfaces

Shape of areas: Irregular Size of areas: 10 to 200 acres

Parent material: Clayey residuum weathered from interbedded shales and siltstones in

the Oakville Sandstone and Fleming Formation of Miocene age

Typical Profile

Surface layer:

0 to 4 inches—grayish brown clay loam

Subsoil:

4 to 24 inches—very pale brown clay

24 to 52 inches—very pale brown clay with many fragments of claystone

Underlying material:

52 to 80 inches—light gray, noncemented claystone

Properties and Qualities

Percent of area covered by surface fragments: Not present Depth to restrictive feature: Bedrock (densic)—52 inches

Slowest permeability class in the soil profile: Slow

Natural soil fertility: Low

Soil reaction: Slightly alkaline or moderately alkaline

Salinity: Saline within 40 inches Sodicity: Sodic within 40 inches

Available water capacity to 60 inches: About 6.4 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: High

Runoff: High

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Severe

Interpretive Groups

Land capability nonirrigated: 4e

Land capability irrigated: None specified Ecological site name: Sloping Clay Loam

Typical vegetation: Native woody species include blackbrush, mesquite, condalia, twisted acacia, and pricklypear. Native grass species include pink pappusgrass, Arizona

cottontop, trichloris, and plains bristlegrass.

Use and Management

Major land use: Rangeland

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- High runoff limits the amount of available water for plant production.
- Salinity in the root zone limits forage production.
- Due to the severe water erosion hazard, conservation measures are needed.

Cropland

Major limitations:

• Due to the severe water erosion hazard, conservation measures are needed.

Minor limitations:

• High lime content limits the production of most crops.

- High runoff limits the amount of available water for plant production.
- Salinity in the root zone limits production of most crops

Wildlife habitat

Major limitations:

· There are no major limitations.

Minor limitations:

- Clayey surface texture limits the use for rangeland wildlife habitat.
- Droughtiness limits plant growth for wildlife habitat.
- Salinity in the root zone limits plant growth for wildlife habitat.

Urban development

Major limitations:

- Slow permeability limits the disposal of septic tank effluent.
- Clayey texture limits the disposal of septic tank effluent and trench type sanitary landfills.
- High shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.
- High sodium content limits the use for trench type sanitary landfills, lawns, and landscaping.

Minor limitations:

Depth to bedrock limits the disposal of septic tank effluent.

Recreation

Major limitations:

 High sodium content limits the use for camp areas, picnic areas, playgrounds, and golf course fairways.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Slow permeability may promote wet conditions and limit the application of waste material.
- Depth to bedrock restricts the use for some applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

Depth to bedrock restricts the use for some applications of wastewater.

StA—Sinton sandy clay loam, 0 to 1 percent slopes, occasionally flooded

Setting

General location: Primarily located in the central part of the county along the Nueces River

Major land resource area: 83A

Mean annual precipitation: 26 to 33 inches (660 to 838 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 270 to 295 days

Geomorphic setting: Nearly level and plane flood plains

Composition

Sinton and similar soils: 80 percent

 The Odem soils are mainly fine sandy loam throughout and are on slightly higher positions.

Contrasting soils: 20 percent

• The Buchel soils are clavey throughout and are on similar positions.

Soil Description

Landscape: Meander belt Landform: Flood plain step

Position on landform: Not specified Slope: Nearly level on plane surfaces Shape of areas: Long and broad Size of areas: 40 to 1,000 acres

Parent material: Loamy alluvium of Quaternary age

Typical Profile

Surface layer:

0 to 7 inches—very dark grayish brown sandy clay loam

Subsurface layer:

7 to 25 inches—very dark grayish brown sandy clay loam

Subsoil:

25 to 66 inches-brown sandy clay loam

66 to 80 inches—yellowish brown sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: High

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.8 inches (high)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Negligible

Flooding frequency: Occasional Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 2w

Land capability irrigated: None specified Ecological site name: Loamy Bottomland

Typical vegetation: Native woody species include elm, live oak, pecan, and hackberry. Native grass species include switchgrass, trichloris, little bluestem, big sandbur,

southwestern bristlegrass, and Virginia wildrye.

Use and Management

Major land use: Cropland (fig. 13)

Other land uses: Pasture, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

· There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

- Flooding hazard limits access of machinery in some years and crop losses.
- High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

• There are no major limitations.

Minor limitations:

Occasional flooding may limit openland wildlife habitat.

Urban development

Major limitations:

- This soil is not suited to urban uses due to flooding hazard and seepage.
- Flooding hazard and poor filtration limit the development of trench type sanitary landfills.

Minor limitations:

Flooding hazard limits the use for shallow excavations, lawns, and landscaping.

Recreation

Major limitations:

Severe flooding hazard limits the use for camp areas.

Minor limitations:

Occasional flooding limits the use for playgrounds and golf course fairways.

Agricultural waste management

Major limitations:

- Flooding hazard may promote wet conditions and limit the application of waste material.
- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.



Figure 13.—A peach orchard on an area of Sinton sandy clay loam, 0 to 1 percent slopes, occasionally flooded.

Minor limitations:

- Flooding hazard limits the disposal of wastewater by irrigation and other methods.
- Level topography limits overland flow of wastewater.

SxA—Sinton clay loam, 0 to 1 percent slopes, frequently flooded Setting

General location: Predominantly in the central part of the county along the Nueces River

Major land resource area: 83A

Mean annual precipitation: 26 to 33 inches (660 to 838 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 270 to 295 days

Geomorphic setting: Nearly level and plane flood plains

Composition

Sinton and similar soils: 80 percent

• The Odem soils are mainly fine sandy loam throughout and are on slightly higher positions.

Contrasting soils: 20 percent

The Buchel soils are clayey throughout and on similar positions.

Soil Description

Landscape: Meander belt Landform: Flood plain

Position on landform: Not specified Slope: Nearly level on plane surfaces Shape of areas: Long and broad Size of areas: 50 to 500 acres

Parent material: Loamy alluvium of Quaternary age

Typical Profile

Surface layer:

0 to 8 inches—very dark gray clay loam

Subsurface layer:

8 to 17 inches—very dark gray clay loam 17 to 22 inches—very dark gray clay

Subsoil.

22 to 80 inches—dark gray and dark grayish brown sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: High

Soil reaction: Slightly alkaline to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 8.1 inches (moderate)

Natural drainage class: Well drained

Shrink-swell potential: Low

Runoff: Negligible

Flooding frequency: Frequent Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight; there is a hazard of scouring by floodwaters in barren areas

adjacent to stream channels Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 5w

Land capability irrigated: None specified Ecological site name: Loamy Bottomland

Typical vegetation: Native woody species include elm, live oak, pecan, and hackberry. Native grass species include switchgrass, trichloris, little bluestem, big sandbur,

southwestern bristlegrass, and Virginia wildrye.

Use and Management

Major land use: Rangeland

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Minor limitations:

• Frequent flooding limits access for livestock and machinery for brief periods in some years.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations

 Frequent flooding limits access for livestock and machinery for brief periods in some years.

Cropland

Major limitations:

 Frequent flooding limits access for machinery for brief periods in some years and crop losses.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Minor limitations:

Frequent flooding may limit openland wildlife habitat.

Urban development

Major limitations:

- This soil is not suited to urban development because of the frequent flooding hazard.
- Seepage limits the use for septic tank adsorption fields and trench type sanitary landfills.

Recreation

Major limitations:

 Severe flooding hazard limits the use for camp areas, playgrounds, and golf course fairways.

Minor limitations:

• Frequent flooding limits the use for picnic areas, paths, and trails.

Agricultural waste management

Major limitations:

- Flooding hazard may promote wet conditions and limit the application of waste material and wastewater.
- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

Minor limitations:

Level topography limits overland flow of wastewater.

TcA—Tiocano clay, 0 to 1 percent slopes

Setting

General location: Predominantly in the southern part of the county within the Northern and Central Rio Grande Plains

Major land resource area: 83A

Mean annual precipitation: 24 to 40 inches (610 to 1,016 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 270 to 290 days

Geomorphic setting: Nearly level closed depressions on interfluves

Composition

Tiocano and similar soils: 90 percent

Contrasting soils: 10 percent

The Papalote soils have loamy surface layers and are on slightly higher positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Closed depression on interfluve, closed depression on ridge

Slope: Nearly level on concave surfaces Shape of areas: Round to oblong

Size of areas: 5 to 20 acres

Parent material: Clayey alluvium in the Goliad Formation of Miocene-Pliocene age or (to a lesser extent) in the Oakville Sandstone and Fleming Formation of Miocene age

Typical Profile

Surface layer:

0 to 8 inches-very dark gray clay

Subsoil:

8 to 59 inches—dark gray clay 59 to 70 inches—grayish brown clay

70 to 80 inches—light brownish gray clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Very slow

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.0 inches (high)

Natural drainage class: Somewhat poorly drained

Shrink-swell potential: Very high

Runoff: Negligible

Flooding frequency: None

Ponding frequency: Occasional with depths of 0 to 1 foot during April to September

Depth to seasonal water table: Present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 4w

Land capability irrigated: None specified

Ecological site name: Lakebed

Typical vegetation: Native woody species include mesquite, huisache, and retama. Native grass species include buffalograss, nutsedge, and curlymesquite.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- Clayey surface texture limits the selection of best-adapted plant species.
- Ponding limits access for machinery and the selection of best-adapted plant species.

Cropland

Major limitations:

Ponding limits access for machinery and the selection of best-adapted plant species.

Minor limitations:

Clayey surface texture limits the selection of best-adapted plant species.

Wildlife habitat

Major limitations:

Wetness and clayey surface texture limit rangeland wildlife habitat.

Minor limitations:

Wetness and very slow permeability limit rangeland wildlife habitat.

Urban development

Major limitations:

- This soil is not suited to urban use due to high shrink-swell potential, clayey texture, ponding, depth to a saturation zone, and very slow permeability.
- Clayey texture, ponding, and depth to a saturation zone limit the development of septic tank adsorption fields and trench type sanitary landfills.
- High shrink-swell potential, ponding, and depth to a saturation zone limit the use for structures and construction of local roads and streets.
- Potential for sloughing severely restricts shallow excavations.

Recreation

Major limitations:

- Depth to a saturation zone and ponding limit the use for camp areas, picnic areas, playgrounds, paths, trails, and golf course fairways.
- Clayey texture limits the use for golf course fairways.

Minor limitations:

- Clayey texture limits the use for camp areas, picnic areas, and playgrounds.
- Clayey surface texture limits the use for paths and trails.

Agricultural waste management

Maior limitations:

This soil is not suited to agricultural waste management because of ponding, depth to a saturation zone, and very slow permeability.

Minor limitations:

Level topography limits overland flow of wastewater.

UsC—Ustarents loamy, 2 to 5 percent slopes

Setting

General location: Predominantly in the northern part of the county within the Northern Rio

Grande Plain

Major land resource area: 83A

Mean annual precipitation: 24 to 36 inches (610 to 914 millimeters)
Mean annual air temperature: 70 to 75 degrees F (21 to 24 degrees C)

Frost-free period: 270 to 300 days

Geomorphic setting: Very gently sloping or gently sloping leveled land

Composition

Ustarents and similar soils: 70 percent

Contrasting soils: 30 percent

- The Choke soils are deep to siltstone and are on similar positions.
- The Eloso soils are moderately deep and are on slightly higher positions.
- The Pavelek soils are shallow and on higher positions.

Soil Description

Landscape: Rolling coastal plain

Landform: Leveled land or reshaped areas

Position on landform: Not specified

Slope: Very gently sloping or gently sloping on concave surfaces

Shape of areas: Long and narrow Size of areas: 20 to 100 acres Parent material: Earthy fill

Typical Profile

Surface layer:

0 to 6 inches—brown sandy clay loam

Underlying material:

6 to 80 inches—pale brown sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: Low

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.0 inches (high)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Medium

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Moderate Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 4e

Land capability irrigated: None specified Ecological site name: Not specified Typical vegetation: Not specified

Use and Management

Major land use: Rangeland

Other land uses: Pasture and wildlife habitat

Management Concerns

Rangeland

Major limitations:

• There are no major limitations.

Pasture

Major limitations:

There are no major limitations.

Cropland

Major limitations:

• There are no major limitations.

Minor limitations:

Due to the moderate water erosion hazard, conservation measures are needed.

Wildlife habitat

Major limitations:

• There are no major limitations.

Urban development

Major limitations:

- There are no major limitations. *Minor limitations:*
- Moderate shrink-swell potential limits the use for structures and roads.
- Low strength limits the use for construction of local roads and streets.

Minor limitations:

Moderate permeability limits the disposal of septic tank effluent.

Recreation

Major limitations:

There are no major limitations.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

W-Water

These areas are natural or constructed bodies of surface water.

WaB—Weesatche fine sandy loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the central and southern part of the county within the

Northern and Central Rio Grande Plains

Major land resource area: 83A

Mean annual precipitation: 28 to 36 inches (711 to 914 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 295 days

Geomorphic setting: Very gently sloping summits, shoulders, and upper backslopes on

ridges

Composition

Weesatche and similar soils: 70 percent

The Pernitas soils are calcareous throughout and are on slightly higher positions.

Contrasting soils: 30 percent

The Clareville and Coy soils have clayey subsoils and are in slightly lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Summit, shoulder, or upper backslope

Slope: Very gently sloping on linear surfaces

Shape of areas: Irregular Size of areas: 20 to 500 acres

Parent material: Loamy alluvium in the Oakville Sandstone and Fleming Formation of Miocene age or (to a lesser extent) in the Goliad Formation of Miocene-Pliocene age

Typical Profile

Surface layer:

0 to 7 inches—dark grayish brown fine sandy loam

Subsoil:

7 to 31 inches—dark grayish brown and brown sandy clay loam 31 to 73 inches—pale brown and light yellowish brown sandy clay loam

73 to 80 inches—pink sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 10.4 inches (high)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Low

Flooding frequency: None

Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 2e

Land capability irrigated: None specified Ecological site name: Sandy Loam

Typical vegetation: Native woody species include Carolina wolfberry, guayacan, Texas kidneywood, and vine ephedra. Native grass species include trichloris, tanglehead, southwestern bristlegrass, Arizona cottontop, and plains bristlegrass.

Use and Management

Major land use: Rangeland

Other land uses: Pasture, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

High lime content limits growth of improved grasses during periods of drought.

Cropland

Major limitations:

• There are no major limitations.

Minor limitations:

- High lime content limits the production of most crops.
- Due to the hazard of erosion, conservation measures are needed.

Wildlife habitat

Major limitations:

There are no major limitations.

Urban development

Major limitations:

• There are no major limitations.

Minor limitations:

- Moderate permeability limits the disposal of septic tank effluent.
- Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

There are no major limitations.

Agricultural waste management

Major limitations:

- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

WaC—Weesatche fine sandy loam, 3 to 5 percent slopes

Setting

General location: Predominantly in the central and southern part of the county within the

Northern and Central Rio Grande Plains

Major land resource area: 83A

Mean annual precipitation: 28 to 36 inches (711 to 914 millimeters)

Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 295 days

Geomorphic setting: Gently sloping summits, shoulders, and upper backslopes on ridges

Composition

Weesatche and similar soils: 70 percent

- The Annarose soils have surface layers that are lighter in color and are on higher positions.
- The Pernitas soils are calcareous throughout and are on similar positions.

Contrasting soils: 30 percent

The Sarnosa soils have less clay in the subsoil and are on slightly higher positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Summit, shoulder, or upper backslope

Slope: Gently sloping on linear surfaces

Shape of areas: Oval

Size of areas: 20 to 100 acres

Parent material: Loamy alluvium in the Oakville Sandstone and Fleming Formation of Miocene age or (to a lesser extent) in the Goliad Formation of Miocene-Pliocene age

Typical Profile

Surface layer:

0 to 11 inches—dark grayish brown fine sandy loam

Subsurface layer:

11 to 15 inches—dark grayish brown sandy clay loam

Subsoil:

15 to 36 inches—dark brown and dark yellowish brown sandy clay loam 36 to 80 inches—brown and very pale brown calcareous sandy clay loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches

Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 8.8 inches (moderate)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Severe Wind erosion hazard: Moderate

Interpretive Groups

Land capability nonirrigated: 3e Land capability irrigated: Specified Ecological site name: Sandy Loam

Typical vegetation: Native woody species include Carolina wolfberry, guayacan, Texas kidneywood, and vine ephedra. Native grass species include trichloris, tanglehead,

southwestern bristlegrass, Arizona cottontop, and plains bristlegrass.

Use and Management

Major land use: Pasture

Other land uses: Rangeland, cropland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Minor limitations:

- High lime content limits growth of improved grasses during periods of drought.
- Due to the severe water erosion hazard, conservation measures are needed.

Cropland

Major limitations:

• Due to the severe water erosion hazard, conservation measures are needed.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

• There are no major limitations.

Urban development

Major limitations:

There are no major limitations.

Minor limitations:

- Moderate permeability limits the disposal of septic tank effluent.
- Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

• There are no major limitations.

Minor limitations:

Slope limits the use for playgrounds.

Agricultural waste management

Major limitations:

- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.

WeB—Weesatche sandy clay loam, 1 to 3 percent slopes

Setting

General location: Predominantly in the central and southern part of the county within the

Northern and Central Rio Grande Plains

Major land resource area: 83A

Mean annual precipitation: 28 to 36 inches (711 to 914 millimeters)
Mean annual air temperature: 70 to 73 degrees F (21 to 23 degrees C)

Frost-free period: 275 to 295 days

Geomorphic setting: Very gently sloping lower backslopes and footslopes on ridges

Composition

Weesatche and similar soils: 70 percent

• The Pernitas soils are calcareous throughout and are on higher positions.

Contrasting soils: 30 percent

The Clareville and Coy soils have clayey subsoils and are in slightly lower positions.

Soil Description

Landscape: Rolling coastal plain Landform: Ridge or interfluve

Position on landform: Lower backslope or footslope Slope: Very gently sloping on concave surfaces

Shape of areas: Irregular Size of areas: 20 to 200 acres

Parent material: Loamy alluvium in the Oakville Sandstone and Fleming Formation of Miocene age or (to a lesser extent) in the Goliad Formation of Miocene-Pliocene age

Typical Profile

Surface layer:

0 to 9 inches—very dark grayish brown sandy clay loam

Subsoil:

9 to 29 inches—very dark grayish brown and brown sandy clay loam

29 to 52 inches—brown and yellowish brown clay loam

52 to 71 inches—very pale brown clay loam

71 to 80 inches—pink loam

Properties and Qualities

Percent of area covered by surface fragments: Not present

Depth to restrictive feature: Not present

Slowest permeability class in the soil profile: Moderate

Natural soil fertility: High

Soil reaction: Neutral to moderately alkaline

Salinity: Not saline within 40 inches Sodicity: Not sodic within 40 inches

Available water capacity to 60 inches: About 9.0 inches (moderate)

Natural drainage class: Well drained Shrink-swell potential: Moderate

Runoff: Low

Flooding frequency: None Ponding frequency: None

Depth to seasonal water table: Not present within 80 inches

Water erosion hazard: Slight Wind erosion hazard: Slight

Interpretive Groups

Land capability nonirrigated: 2e

Land capability irrigated: None specified

Ecological site name: Clay Loam

Typical vegetation: Native woody species include Carolina wolfberry, guayacan, Texas kidneywood, and vine ephedra. Native grass species include trichloris, tanglehead, southwestern bristlegrass, Arizona cottontop, and plains bristlegrass.

Use and Management

Major land use: Cropland (fig. 14)

Other land uses: Pasture, rangeland, and wildlife habitat

Management Concerns

Rangeland

Major limitations:

There are no major limitations.

Pasture

Major limitations:

• There are no major limitations.

Cropland

Major limitations:

There are no major limitations.

Minor limitations:

High lime content limits the production of most crops.

Wildlife habitat

Major limitations:

There are no major limitations.

Urban development

Major limitations:

· There are no major limitations.

Minor limitations:

- Moderate permeability limits the disposal of septic tank effluent.
- Clay content in the soil limits the development of trench type sanitary landfills.

• Moderate shrink-swell potential limits the use for structures and roads.

Recreation

Major limitations:

• There are no major limitations.

Agricultural waste management

Major limitations:

- Moderate permeability may promote wet conditions and limit applications of wastewater.
- Seepage limits the use for overland flow of wastewater.



Figure 14.—Corn growing on an area of Weesatche sandy clay loam, 1 to 3 percent slopes.

Prime Farmland

Prime farmland is one of several kinds of important farmland defined by the U.S. Department of Agriculture. It is of major importance in meeting the Nation's short- and long-range needs for food and fiber. Because the supply of high-quality farmland is limited, the U.S. Department of Agriculture recognizes that responsible levels of government, as well as individuals, should encourage and facilitate the wise use of our Nation's prime farmland.

Prime farmland, as defined by the U.S. Department of Agriculture, is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses. It could be cultivated land, pastureland, forestland, or other land, but it is not urban or built-up land or water areas. The soil qualities, growing season, and moisture supply are those needed for the soil to economically produce sustained high yields of crops when proper management, including water management, and acceptable farming methods are applied. In general, prime farmland has an adequate and dependable supply of moisture from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, an acceptable salt and sodium content, and few or no rocks. It is permeable to water and air. It is not excessively erodible or saturated with water for long periods, and it either is not frequently flooded during the growing season or is protected from flooding. Slope ranges mainly from 0 to 5 percent. More detailed information about the criteria for prime farmland is available at the local office of the Natural Resources Conservation Service.

About 249,085 acres in the survey area, or about 35 percent of the total acreage, meets the soil requirements for prime farmland and about 123,694 acres or about 17 percent of the total acreage, meets the requirement for prime farmland, if irrigated.

A recent trend in land use in some parts of the survey area has been the loss of some prime farmland to industrial and urban uses. The loss of prime farmland to other uses puts pressure on marginal lands, which generally are more erodible, droughty, and less productive and cannot be easily cultivated.

The map units in the survey area that are considered prime farmland are listed in Table 5. This list does not constitute a recommendation for a particular land use. On some soils included in the list, measures that overcome a hazard or limitation, such as flooding, wetness, and droughtiness, are needed. Onsite evaluation is needed to determine whether or not the hazard or limitation has been overcome by corrective measures. The extent of each listed map unit is shown in Table 4. The location is shown on the detailed soil maps. The soil qualities that affect use and management are described under the heading "Detailed Soil Map Units."

Use and Management of the Soils

This soil survey is an inventory and evaluation of the soils in the survey area. It can be used to adjust land uses to the limitations and potentials of natural resources and the environment. Also, it can help to prevent soil-related failures in land uses.

In preparing a soil survey, soil scientists, conservationists, engineers, and others collect extensive field data about the nature and behavioral characteristics of the soils. They collect data on erosion, droughtiness, flooding, and other factors that affect various soil uses and management. Field experience and collected data on soil properties and performance are used as a basis in predicting soil behavior.

Information in this section can be used to plan the use and management of soils for crops and pasture; as rangeland and forestland; as sites for buildings, sanitary facilities, highways and other transportation systems, and parks and other recreational facilities; for agricultural waste management; and as wildlife habitat. It can be used to identify the potentials and limitations of each soil for specific land uses and to help prevent construction failures caused by unfavorable soil properties.

Planners and others using soil survey information can evaluate the effect of specific land uses on productivity and on the environment in all or part of the survey area. The survey can help planners to maintain or create a land use pattern in harmony with the natural soil.

Contractors can use this survey to locate sources of sand and gravel, roadfill, and topsoil. They can use it to identify areas where bedrock, wetness, or very firm soil layers can cause difficulty in excavation.

Health officials, highway officials, engineers, and others may also find this survey useful. The survey can help them plan the safe disposal of wastes and locate sites for pavements, sidewalks, campgrounds, playgrounds, lawns, and trees and shrubs.

Crops and Pasture

General management needed for crops and pasture is suggested in this section. The estimated yields of the main crops and pasture plants are listed and the system of land capability classification used by the Natural Resources Conservation Service is explained.

Planners of management systems for individual fields or farms should consider the detailed information given in the description of each soil under the heading "Detailed Soil Map Units." Specific information can be obtained from the local office of the Natural Resources Conservation Service or Texas Cooperative Extension.

Cropland

Jim Childers, Conservation Agronomist, Natural Resources Conservation Service, helped prepare this section.

Approximately 75,000 acres of the land area is devoted to cropland (fig. 15) in Live Oak County. Irrigated cropland acreage is insignificant in the county. This section pertains to the use and management of the soils in the county with respect to dryland cropland.

Of the cropland acreage in Live Oak County, according to the 1994 Texas Agricultural Statistics, about 40,000 acres was cropped annually. The primary crops and acreage being grown are corn—16,200 acres; grain sorghum—12,100 acres; cotton—3,600 acres; and wheat—7,700 acres. The balance of about 35,000 acres of the cropland

acreage is idle or is currently being used as pasture or hayland. The majority of the cropland is found on the Buchel, Campbellton, Clareville, Coy, Eloso, Esseville, Lattas, Monteola, Pernitas, Rosenbrock, Sinton, and Weesatche soils.

The potential of the soils in Live Oak County for increased production of food and fiber is good. In addition to the reserve productive capacity represented by the land currently in other uses, food production could also be increased considerably by extending the latest crop production technology to all cropland in the county.

Because of the limited rainfall and high evaporation and transpiration rates in Live Oak County, conserving moisture is the primary management concern. Erosion control practices increase water infiltration, maintain soil productivity by reducing runoff, soil blowing, and provide a protective cover on the surface.

A typical growth curve for small grains representing the percentage of total growth occurring each month for Live Oak County would be:

Ī	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
ĺ	14	18	21	22	6	0	0	0	0	0	9	10

A cropping system that keeps the vegetative cover on the soil surface for extended periods can maintain the needed moisture and keep soil erosion losses to amounts that will not reduce the productive capacity of the soils. Erosion of the surface layer results in reduced productivity. Loss of the surface layer is especially damaging to soils that have clayey subsoils, such as Imogene and Papalote soils, because part of the subsoil is incorporated into the plow layer.

Loss of the surface layer is damaging to soils that have a layer in or below the subsoil that limits the depth of the root zone. For example, Condido, Ecleto, Goliad, Lacoste, Olmos, Parrita, Pavelek, Picosa, and Sancajo soils have a layer of indurated caliche. Of these, Goliad soils present the least problem since the indurated caliche layer is deeper in the soil profile.



Figure 15.—Grain sorghum growing on an area of Lattas clay, 0 to 1 percent slopes.

Soil erosion also reduces productivity on soils that tend to be droughty and on those with a low available water capacity. In Live Oak County, the main limitations are indurated caliche layers, gravelly, or sandy textures. Condido, Ecleto, Goliad, Lacoste, Olmos, Parrita, Pavelek, Picosa, and Sancajo soils have indurated caliche layers. Hindes and Mata soils are gravelly soils. Nusil and Rhymes soils have sandy surfaces. In areas of sloping soils, tilling or preparing a good seedbed is difficult in claypan soils because the original friable surface layer has been eroded away. Claypans are common in Esseville, Goliad, Imogene, Laparita, Papalote, and Schattel soils.

Various combinations of conservation practices are needed on cropland to utilize rainfall efficiently, maintain fertility and tilth levels, protect water quality of streams and reservoirs, and protect the soil from wind and water erosion. Management practices such as conservation cropping system, crop residue management, conservation tillage, contour farming, cover crops, surface roughening, filter strips, stripcropping, and nutrient management are needed. With proper management, these practices generally result in higher sustained crop yields.

On the steeper slopes, contour farming, terraces, contour or field stripcropping, diversions, and grassed waterways are needed to conserve water and control erosion. Where slopes exceed 1 percent, erosion by water potentially becomes a major problem. Clareville, Coy, Esseville, Lattas, Monteola, Papalote, Pernitas, and Weesatche soils are the primary cropland soils with slopes of 1 to 5 percent. On many of the nearly level soils, contour farming, either alone or in combination with terraces, and crop residue management or conservation tillage helps to increase the amount of rainfall absorbed by the soil.

Soil erosion results in the sedimentation of streams. Grass buffer strips are desirable along creeks, rivers, and other waterways. These vegetative zones provide a buffer to trap sediment, nutrients, and pesticides. These pollutants lower water quality of the streams and reservoirs, which are used for municipal, recreation, fish, and wildlife purposes.

Information on the detailed specifications of the wind or water erosion control practices for each kind of soil in the survey area is available in the Field Office Technical Guide at the local office of the Natural Resources Conservation Service. The next several sections provide a short description of the major practices utilized in Live Oak County.

Conservation Cropping System. The crops commonly grown in the survey area can be used to plan a crop rotation system. When fertilizer is added, these crops produce enough residue to provide the necessary organic matter to maintain soil tilth. Soil tilth is an important factor in the germination of seeds and in the infiltration of water into the soil. Soils that are granular and porous have good tilth.

Tillage should be sufficient to prepare a good seedbed and control weeds. Excessive tillage when the soil is wet causes the formation of a compaction zone by altering soil structure and reducing porosity. Poor soil structure and plowpans restrict water intake and reduce the porosity of the soil.

Compaction zones restrict root growth. The ability of the root system of a crop to take up moisture and nutrients is limited. Compaction also increases the loss of moisture and nutrients through water runoff, water erosion, and decreased yields. Crop rotation, crop residue management, conservation tillage, deep chiseling, and controlled traffic patterns are practices that will reduce soil compaction problems. Soils with a large amount of clay content in the upper layers are highly susceptible to the formation of these compaction zones. These include all the major cropland soils except for Pernitas and Weesatche.

Nutrient Management. The proper use of fertilizer is needed on all cultivated soils. Soil analyses and knowledge of the fertilizer application history on a field are needed to accurately estimate the kinds and amounts of nutrients needed. Fertilizer should be added on the basis of soil tests, the need of the crop, and the expected yield level. The local offices of the Natural Resources Conservation Service or the Texas Cooperative Extension can help to determine the kind and amount of fertilizer to apply.

Specific soils may possess unique problems related to soil chemistry and fertility. Salinity on Campbellton, Esseville, Imogene, Laparita, Mata, and Schattel soils creates problems. Crops grown on soils with high levels of calcium carbonate often exhibit chlorosis or yellowing of the leaves. All of the major cropland soils have some susceptibility to this problem. In severe cases, the affected plants will die.

Most soils in Live Oak County have reactions (soil pH) that are neutral to moderately alkaline in their natural state. Nusil, Papalote, and Rhymes soils have a high amount of sand and range from moderately acid to moderately alkaline. Monteola, Conquista, and Imogene soils are moderately alkaline or strongly alkaline.

An annual soil analysis can detect buildup or depletion of required amendments for the specific crop, and needed adjustments may be made. A soil's cation exchange capacity provides a measure of its ability to hold and exchange needed nutrients. Major cropland soils with a low cation exchange capacity include Clareville, Lattas, and Sinton soils. In addition, plant tissue analyses can be used to determine nutrient deficiencies in a growing crop. In some instances, use of more adapted crops and crop rotations may prove beneficial in dealing with imbalances in soil nutrient levels.

Crop Residue Management. Crop residues maintained on the surface protect the soil against wind and water erosion. Crop residue left on the surface reduces surface crusting, increases water intake, decreases runoff, erosion, protects the soil against packing by rain and farm equipment, and lowers soil temperature. Crop residue reduces evaporation of soil moisture as well as minimizes the susceptibility to wind erosion.

Wind erosion is a very severe hazard on the sandy Nusil and Rhymes soils. Soil blowing is also a major problem, but to a lesser degree, on the following soils: Condido, Conquista, Eloso, Fashing, Goliad, Imogene, Lacoste, Papalote, Pavelek, and Rosenbrock. Soil blowing can damage these soils in a few hours if the winds are strong and the soils are dry, bare of vegetation or surface mulch, crusted, and do not have adequate roughness. Maintaining a vegetative cover, surface mulch, or short field width minimizes the problem.

Crop residue improves the tilth of the surface layer and should not be burned or grazed. Where slopes are short and irregular, cropping systems and residue management systems provide substantial surface cover, which are often the most feasible means to control water erosion.

Conservation Tillage. Conservation tillage is a more intensive crop residue management program. Conservation tillage requires higher level of management by the land user. This practice requires more herbicide usage and less mechanical tillage. Conservation tillage can be used on most soils in the survey area. It is more difficult to use successfully on eroded soils and on soils that have a clayey surface layer, such as Buchel, Eloso, Esseville, Lattas, Monteola, and Rosenbrock. The acreage of conservation tillage for corn and grain sorghum is increasing. The practice effectively reduces erosion on sloping land.

Cover Crop. Some soils that are used for crops have a surface layer that is light in color and low in organic matter content. Generally, the structure of such soils is weak, and heavy rainfall causes a crust to form on the surface. The crust is hard when the surface is dry and is nearly impervious to water. Once the crust forms, it reduces infiltration, increases runoff, and increases susceptibility to wind erosion. Growing cover crops or adding crop residue, manure, and other organic material helps to improve soil structure and reduce crusting. Soils most severely affected by crusting include Annarose, Campbellton, Hindes, Mata, Nusil, Papalote, and Rhymes.

Surface Roughening. Surface roughening should be used on soils that are susceptible to wind erosion when they are crusted. When this practice is applied perpendicular to the prevailing wind, ridges and a cloddy condition provide some protection from wind erosion. Factors to be considered when applying this practice are soil texture, soil moisture, type of implement, depth of operation, and timeliness. Clay,

clay loam, and sandy loam soils which have significant clay content within the plow layer are most suitable for this practice.

Contour Farming. Contour farming to control erosion is in widespread use in the survey area. It is best suited to soils that have smooth uniform slopes. Contour farming is used to conserve moisture, reduce runoff, and help control erosion. On slopes of more than 1 percent, contour farming should be used in combination with terraces. In some areas, slopes are so short and irregular that contour tillage or terracing is not practical. On these fields, a cropping system that provides substantial vegetative cover is required to control erosion unless conservation tillage is practiced.

Stripcropping. Wind stripcropping systems are used to protect sandy soils against the hazard of wind erosion. The system consists of growing a relatively tall close-growing crop, such as wheat or forage sorghum to reduce the field widths. When the soils are dry, crusted, and wide field width occurs, this is an ideal environment for wind erosion. Wind strips are also used to protect susceptible crops, such as watermelons, from excessive crop damage.

Filter Strips. Vegetative riparian zones at the edges of crop fields along streams help to prevent offsite damages from occurring. These vegetative zones trap sediment, nutrients, and pesticides which lower the water quality of the streams and reservoirs. These strips are especially important along the Nueces River and its major tributaries to provide protection for Lake Corpus Christi for municipal use, recreation, fish, and wildlife purposes.

Terraces and Diversions. Terraces and diversions reduce the length of the slope. They are used either to reduce runoff, thus conserving moisture and helping to control erosion; or to divert runoff from higher lying soils to protect cropland in lower areas. Due to short periods of heavy rainfall, terraces are necessary to carry the excess water to a safe outlet. Soils that are shallow or gravelly are not suited to terraces. These soils include Condido, Conquista, Ecleto, Hindes, Lacoste, Mata, Olmos, Parrita, Pavelek, Picosa, Sancajo, and Ustarents.

Terraces designed to reduce runoff must be used in combination with contour farming if they are to be fully effective. Parallel terraces increase the efficiency of large equipment. They facilitate farming on the contour and there are no short rows between the terraces.

Grassed Waterways. In swales and low areas where natural drainage patterns occur in crop fields, grassed waterways are needed to remove the excess water safely. They are also needed with most terrace systems to carry the water diverted from the fields. Grassed waterways should be built according to engineering specifications. In most places, a perennial grass should be planted. Once the grass is established, it can be grazed, hayed, or harvested for seed. The cover should be managed so that excessive deposition or scouring does not occur.

Drainage. Without artificial drainage, some of the Buchel, Esseville, Lattas, Monteola, and Tiocano soils stay wet for such long periods that planting is delayed or crops are damaged in some years. Flooding problems also occur on Buchel, Odem, and Sinton soils. Clareville, Coy, Eloso, and Rosenbrock soils have good natural drainage most of the year, but they tend to dry out slowly after rains.

The design of surface and subsurface drainage systems varies with the kind of soil. Surface drainage is needed in most areas of poorly drained soils that are used for row crops. Drains have to be more closely spaced in areas of slowly permeable soils than in areas of more permeable soils. Finding adequate outlets for a drainage system is difficult in some areas. Information on drainage design for each kind of soil is available in the local office of the Natural Resources Conservation Service.

Pasture and Hayland

In Live Oak County, approximately 67,500 acres is devoted to pasture (fig. 16) and hayland. A significant acreage of cropland is currently being used as pasture and hayland. Pasture and hayland consist of perennial grasses used for forage. Almost all of these areas are nonirrigated.

Soil erosion is a major soil problem on the pastureland in Live Oak County. If the slope is more than 1 percent, erosion is a hazard. Clareville, Cotulla, Coy, Danjer, Eloso, Esseville, Monteola, Nusil, Papalote, Pernitas, Rosenbrock, Sarnosa, and Weesatche soils have slopes of 1 to 5 percent.

According to the 1994 Texas Agricultural Statistics, there were over 56,000 head of cattle in Live Oak County. Livestock plays an important role in this agricultural community. However, the basic commodity is the pasture and hayland resource. Profitable livestock production is dependent on a producer's ability to efficiently convert forage into a marketable product, meat, wool, or milk. This section deals with the use and management of soils in the county in respect to this land use.

Management practices needed on pasture and hayland include choosing plants adapted to the soil, the proper application of fertilizer, and rotation grazing and weed control. Timing of actions in all phases of forage management is crucial for maximum, efficient, and quality production. On irrigated land, proper management of the irrigation water is necessary.

Species Selection. Introduced species of perennial grasses are generally used for quantity and quality forage production. However, many grasses producing high forage yields are adapted for improved pastures. The most widely used grasses are kleingrass, common and improved bermudagrass, King Ranch bluestem, other improved bluestems, Willman lovegrass, Bell rhodesgrass, and johnsongrass. The improved bermudagrasses are the most widely used

Many high producing grasses are adapted to irrigated pastures. Hybrid bermudagrass is one of the more versatile plants; it can be grown successfully on many kinds of soil. Other grasses suitable on irrigated land include blue panicum, bufflegrass, Medio bluestem, Gordo bluestem, Bell rhodesgrass, Kleingrass 75, and weeping lovegrass.



Figure 16.—A pasture on Pernitas fine sandy loam, 2 to 5 percent slopes.

Grasses adapted to nonirrigated clays and clay loams include blue panicum, bufflegrass, common or improved bermudagrass, Kleingrass 75, Gordo bluestem, Kleberg bluestem, and King Ranch bluestem. On the more sandy soils, high producing grasses include weeping lovegrass, hybrid bermudagrass, bufflegrass, and blue panicum.

Fertilizer Application. The soil type, plant species, and the desired level of forage production determine fertilizer requirements. Fertilizer application is generally necessary in establishing grass, especially on old cropland that is being converted to pasture.

Application of commercial fertilizer or the interseeding of legumes is essential for quality production of forage on pasture and hayland. Fertilizer application is essential on irrigated pasture and hayland. Fertilizer applications on nonirrigated pasture should be made only when soil moisture is adequate.

Fertilizer should be applied according to need as indicated by a current soil test or plant analysis. However, some general recommendations can be made. Most of the soils require nitrogen and phosphorus for production. Potassium is adequate in most soils. Perennial grasses remove nitrogen and phosphoric acid from the soil in a ratio of about 4 to 1; therefore, on an annual basis, an average of four pounds of nitrogen should be applied for each pound of phosphoric acid. All of the phosphoric acid can be applied at one time, but the nitrogen should be applied in two to six applications.

Rotational Grazing. A basic goal of any grazing system should be to provide quality grazing over an extended period of time, thus reducing stored feed requirements. Having livestock harvest the forage on the stem reduces the costs associated with production.

Timely rotational grazing of pastures can maximize the productivity of the forage and its nutritional value to the livestock. Proper rotational grazing can contribute to realizing maximum returns from forages and irrigation efforts. A proper stocking rate balances the number of grazing animals with forage production.

Weeds and brush compete with desirable vegetation for the available moisture and nutrients. They can be controlled by prescribed burning, mowing, or by herbicides. Weeds generally are a minor problem on pastures that are well fertilized and properly grazed.

Yields Per Acre

The average yields per acre that can be expected of the principal crops under a high level of management are shown in Table 6. In any given year, yields may be higher or lower than those indicated in the table because of variations in rainfall and other climatic factors. The land capability classification of map units in the survey area also is shown in the table.

The yields are based mainly on the experience and records of farmers, conservationists, and extension agents. Available yield data from nearby counties and results of field trials and demonstrations also are considered.

The management needed to obtain the indicated yields of the various crops depends on the kind of soil and the crop. Management can include drainage, erosion control, and protection from flooding; the proper planting and seeding rates; suitable high-yielding crop varieties; appropriate and timely tillage; control of weeds, plant diseases, and harmful insects; favorable soil reaction and optimum levels of nitrogen, phosphorus, potassium, and trace elements for each crop; effective use of crop residue, barnyard manure, and green manure crops; and harvesting that ensures the smallest possible loss.

For yields of irrigated crops, it is assumed that the irrigation system is adapted to the soils and to the crops grown, that good-quality irrigation water is uniformly applied as needed, and that tillage is kept to a minimum.

The estimated yields reflect the productive capacity of each soil for each of the principal crops. Yields are likely to increase as new production technology is developed.

The productivity of a given soil compared with that of other soils, however, is not likely to change.

Crops other than those shown in Table 5 are grown in the survey area, but estimated yields are not listed because the acreage of such crops is small. The local office of the Natural Resources Conservation Service or Texas Cooperative Extension can provide information about the management and productivity of the soils for those crops.

Land Capability Classification

Land capability classification shows, in a general way, the suitability of soils for most kinds of field crops. Crops that require special management are excluded. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. The criteria used in grouping the soils do not include major and generally expensive landforming that would change slope, depth, or other characteristics of the soils, nor do they include possible but unlikely major reclamation projects. Capability classification is not a substitute for interpretations designed to show suitability and limitations of groups of soils for rangeland, for forestland, or for engineering purposes.

In the capability system, soils are generally grouped at three levels—capability class, subclass, and unit (20).

Capability classes, the broadest groups, are designated by the numbers 1 through 8. The numbers indicate progressively greater limitations and narrower choices for practical use. The classes are defined as follows:

Class 1 soils have slight limitations that restrict their use.

Class 2 soils have moderate limitations that restrict the choice of plants or that require moderate conservation practices.

Class 3 soils have severe limitations that restrict the choice of plants or that require special conservation practices, or both.

Class 4 soils have very severe limitations that restrict the choice of plants or that require very careful management, or both.

Class 5 soils are subject to little or no erosion but have other limitations, impractical to remove, that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 6 soils have severe limitations that make them generally unsuitable for cultivation and that restrict their use mainly to pasture, rangeland, forestland, or wildlife habitat.

Class 7 soils have very severe limitations that make them unsuitable for cultivation and that restrict their use mainly to grazing, forestland, or wildlife habitat.

Class 8 soils and miscellaneous areas have limitations that preclude commercial plant production and that restrict their use to recreational purposes, wildlife habitat, watershed, or esthetic purposes.

Capability subclasses are soil groups within one class. They are designated by adding a small letter, e, w, s, or c, to the class numeral, for example, 2e. The letter e shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; w shows that water in or on the soil interferes with plant growth or cultivation (in some soils the wetness can be partly corrected by artificial drainage); s shows that the soil is limited mainly because it is shallow, droughty, or stony; and c, used in only some parts of the United States, shows that the chief limitation is climate that is very cold or very dry.

In class 1 there are no subclasses because the soils of this class have few limitations. Class 5 contains only the subclasses indicated by w, s, or c because the soils in class 5 are subject to little or no erosion. They have other limitations that restrict their use to pasture, rangeland, forestland, wildlife habitat, or recreation.

Capability units are soil groups within a subclass. The soils in a capability unit are enough alike to be suited to the same crops and pasture plants, to require similar management, and to have similar productivity. Capability units are generally designated

by adding an Arabic numeral to the subclass symbol, for example, 2e-4 and 3e-6. These units are not given in all soil surveys.

The capability classification of map units in this survey area is given in the section "Detailed Soil Map Units" and in the yields table.

Rangeland

Joe D. Franklin, Rangeland Management Technical Specialist, Kerrville, Texas assisted with this section.

Rangeland is the land on which the native vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. In areas that have similar climate and topography, the kind and amount of vegetation produced are closely related to the kind of soil. Effective management is based on the relationship of soils, vegetation, and water. Rangeland or native grassland receives no regular or frequent cultural treatment, such as fertilizer or tillage.

About 520,000 acres or 75 percent of Live Oak County is rangeland. The rangeland in Live Oak County is located within the Rio Grande Plains Major Land Resource Area (MLRA 83). The soils are generally neutral to moderately alkaline or calcareous with loamy surfaces over loamy and clayey subsoils. The original vegetation grew predominantly on open grassland. It consisted of tall, mid, and short grasses interspersed with woody shrubs and some trees. The relatively abundant woody shrubs were suppressed by periodic fires, some of which were started by lightning and others by the Indian inhabitants of the area.

The vegetative community on the rangeland in the county has changed drastically during the past 150 years. The major factors in the vegetative shift are fluctuating climatic conditions; continuous heavy overgrazing by livestock; and the elimination of fire, both prescribed and wild. Woody plants have increased in abundance on much of the rangeland. The more productive grasses and forbs have been grazed out in some areas and replaced by a mixture of short grasses and annual forbs.

Forage production in areas of rangeland occurs primarily during two distinct growth periods. Most of the annual growth occurs in April, May, and June, when spring rains and moderate temperatures are most favorable to the growth of warm-season plants. A secondary growth period usually occurs in September and October, when fall rains and gradually cooling temperatures are common. A typical growth curve for native perennial vegetation representing the percentage of total growth occurring each month for Live Oak County would be:

Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1	2	3	7	20	30	15	5	10	4	2	1

Approximately 72 percent of the annual production of forage occurs in the months April through July responding to spring and early summer rains. A second smaller growth period may occur in the fall if sufficient moisture is available.

In many areas, the forage provided by native grassland is supplemented by improved grasses and by grazing crops produced on cropland. Bufflegrass, kleingrass, improved bermudagrass, and Kleberg bluestem are common improved pasture grasses. Small grain and forage sorghums are the most common grazing crops produced on cropland.

Ecological Sites, Similarity Index, Trend, and Health

Soils vary in their capability to produce grasses, forbs, and woody plants suitable for grazing. Soils that produce about the same kinds and amounts of native plants are grouped into what is called an ecological site. Soils are the basis for determining, correlating, and differentiating ecological sites.

An ecological site is a distinctive kind of rangeland that produces a characteristic natural plant community that differs from those on other ecological sites in the kind,

amount, and proportion of range plants, and in its response to management. An ecological site will have unique hydrologic characteristics, specifically an infiltration and runoff relationship that has developed over time. The development of the vegetation, the soil, and the hydrology are all very interrelated. Each has an effect on and influences the development of the others. The natural plant community on the ecological site is also referred to as the historic climax plant community or climax vegetation because it represents the culmination of the effects of all the factors of the natural environment.

Historic climax vegetation is the stabilized plant community that reproduces itself and changes very little so long as the environment remains unchanged. The historic climax vegetation consists of the plants that grew there before the area was first settled. The most productive combination of native forage plants on an ecological site is generally the climax vegetation.

Ecological sites are subject to many influences that temporarily modify or even destroy vegetation. Examples are drought, floods, long-term overgrazing, wild fires, and brush management. If the changes are not too severe, the plant community will recover and over time return to climax condition. However, severe deterioration may permanently alter the potential of the ecological site.

Grazing can change the quality and quantity of forage on an ecological site by changing the proportion of decreasers, increasers, and invader plants in the composition of the plant community.

Decreasers are plants in the climax vegetation that decrease in relative amount under continuous close grazing. They generally are the tallest, most productive perennial grasses and forbs and the most palatable to livestock.

Increasers are plants in the climax vegetation that increase in relative amount as the more desirable decreasers are reduced by continuous close grazing. They are commonly shorter than decreasers and are generally less palatable to livestock.

Invaders are plants that are normally not included in the historic climax plant community because they cannot compete with the climax vegetation for moisture, nutrients, and light. They invade the site and grow along with increasers only after the climax vegetation has been reduced by continual heavy grazing. Most invader species have little grazing value.

Range management requires a knowledge of the kinds of soils and of the climax or potential native plant community on a particular ecological site. The current rangeland similarity index, trend and health are assessed. The current plant community is compared to the historic climax plant community to determine the rangeland similarity index. The more closely the current community resembles the climax community, the greater the rangeland similarity index. The rangeland similarity index is only an ecological rating and does not have a specific meaning relating to the existing plant community intended for any given use.

Trend is a rating of the direction of change that is occurring on a particular ecological site. The plant community and its associated components, are either succeeding towards or regressing away from the climax plant community. Trend is not static although sometimes it is difficult to determine the direction of change and may not be apparent to those unfamiliar to that particular site.

Trend can be determined only after evaluating the following attributes that affect the rangeland trend: species composition changes, abundance of seedlings and young plants, plant residues, plant vigor, and condition of the soil surface. Evaluation of any one of these factors on an ecological site can indicate whether the plant community is improving or regressing. The most accurate evaluation of trend occurs when all or several of the factors are considered in their proper relation with each other.

Further information about the range similarity index and rangeland trend is available in chapter 4 of the "National Range and Pasture Handbook" or on the internet at the following address: http://www.glti.nrcs.usda.gov/technical/publications/nrph.html.

Rangeland health is the degree to which the integrity of the soil, the vegetation, the water and the air as well as the ecological processes of the rangeland ecosystem is balanced and sustained. Rangeland health is an ecological rating that evaluates the current functioning of the ecological processes on an ecological site. Range and health determinations provide the decision-maker with information and data on the functioning of the ecological processes and the stability of the site. The evaluation of a site also provides information on site potential, integrity, and the ability for the site to respond to treatment.

Rangeland health indicators are divided into three areas of evaluation: 1) the degree of soil and site stability and watershed function; 2) integrity of the nutrient cycle and flow; and 3) the presence of functioning recovery mechanisms. A single rating of healthy, at risk, or unhealthy will not be given to a site.

Forage production depends on the ecological site. Current forage production depends on the types of plants present and the moisture available to plants during their growing season.

Good livestock and forage production on rangeland is achieved mainly by managing the time of grazing and limiting the amount of forage removed. Some of the food manufactured by the leaves of plants is used for growth and some is stored for use in regrowth and seed production.

Following years of prolonged overuse of range, seed sources of desirable vegetation are eliminated. Vegetation can be reestablished by applying one or a combination of the following practices: mechanical or chemical treatment, range planting, fencing, water development, prescribed burning, or other treatments to revitalize stands of native plants. Thereafter, prescribed grazing must be applied to maintain and improve the range. The physical practices should be followed by grazing management and follow-up brush management for maintenance. The combination of alternatives, or Resource Management Systems (RMS) is essential if rangeland productivity is to be maintained. Following are some of the more commonly used resource management practices.

Prescribed Grazing. The objective of this practice is the controlled harvest of vegetation with grazing or browsing animals, managed with the intent to achieve a specific objective(s). Such management generally results in the optimum production of vegetation, control of undesirable brush species, conservation of water, and control of erosion. Sometimes an area with a range similarity index somewhat below the potential meets grazing needs, provides wildlife habitat, and protects soil and water resources.

Fencing. This practice excludes livestock from areas needing protection from grazing and confines livestock to a specific area. Fencing also subdivides grazing land to permit use of a planned grazing system and protects new seedlings of plantings from grazing.

Prescribed Burning. Livestock operators and wildlife managers use this practice to periodically remove or reduce a dense cover of mature vegetation, to improve plant diversity and quality, and to change the structure of the vegetation. When done properly and at the right time, prescribed burning stimulates new succulent growth, helps to restore climax plant species, and reduces infestations of unwanted weeds and brush. However, desirable plants can be severely damaged or killed if the soil surface is too dry, allowing the fire to reach the plant crowns and roots. Burn frequency depends upon goals and objectives. Prescribed burning is an effective management tool that can be substituted for chemical or mechanical treatment or used in combination with chemical or mechanical treatments.

Table 7 shows for each soil in the survey area that supports range vegetation, the ecological site and the potential annual production in favorable, average, and unfavorable years. Only soils that are used as rangeland or are suited to rangeland are listed.

An *ecological site* is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time throughout the soil development process; a characteristic hydrology, particularly infiltration and runoff that has developed over time; and a characteristic plant community (kind and amount of

vegetation). The hydrology of a site is influenced by development of the soil and plant community. The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and proportion of species or in total production. Descriptions of ecological sites are provided in the Field Office Technical Guide, which is available in local offices of the Natural Resources Conservation Service, or online at http://www.nrcs.usda.gov/technical/efotg.

Total dry-weight production is the amount of vegetation that can be expected to grow annually on well-managed rangeland that is supporting the potential natural plant community. It includes all vegetation, whether or not it is palatable to grazing animals. It includes the current year's growth of leaves, twigs, and fruits of woody plants. It does not include the increase in stem diameter of trees and shrubs. It is expressed in pounds per acre of air-dry vegetation for favorable, normal, and unfavorable years. In a favorable year, the amount and distribution of precipitation and the temperatures make growing conditions substantially better than average. In a normal year, growing conditions are about average. In an unfavorable year, growing conditions are well below average, generally because of low available soil moisture. Yields are adjusted to a common percent of air-dry moisture content. The relationship of green weight to air-dry weight varies according to such factors as exposure, amount of shade, recent rains, and unseasonable dry periods.

Characteristic vegetation is the grasses, forbs, and shrubs that make up most of the potential natural plant community on each soil is listed by common name. Under rangeland composition, the expected percentage of the total annual production is given for each species making up the characteristic vegetation. The amount that can be used as forage depends on the kinds of grazing animals and on the grazing season.

Following is a description of the nineteen ecological sites in Live Oak County: Blackland, Clay Loam, Clayey Bottomland, Claypan Prairie, Gravelly Ridge, Gray Sandy Loam, Lakebed, Loamy Bottomland, Loamy Sand, Rolling Blackland, Saline Clay, Saline Clay Loam, Sandy, Sandy Loam, Shallow, Shallow Ridge, Shallow Sandy Loam, Sloping Clay Loam, and Tight Sandy Loam.

Blackland Ecological Site. The Lattas soil, in map units LtA and LtB, is in the Blackland ecological site. The historic climax plant community is a fire climax, open grassland prairie. The composition by weight is 90 percent grasses and 10 percent forbs.

This site has high natural fertility. The historic climax plant community is dominated by little bluestem, yellow Indiangrass, trichloris, and sideoats grama, which make up half of the annual production. Other important grass species are Arizona cottontop, pink pappusgrass, pinhole bluestem, and plains bristlegrass. Many palatable forbs and legumes are native to this site.

Heavy continuous overgrazing by cattle causes a decrease in the annual production of the most desirable plants such as little bluestem, sideoats grama, yellow Indiangrass, and trichloris. These plants are replaced by increaser plants such as pinhole bluestem, buffalograss, Texas wintergrass, and other perennial grasses. If heavy continuous overgrazing continues Texas grama, tumblegrass, threeawns, and annuals invade the site. Brush species such as mesquite, spiny hackberry, huisache, lotebush, and agarito also invade.

Clay Loam Ecological Site. The Clareville and Weesatche soils, in map units CkA, CkB, and WeB, are in the Clay Loam ecological site. The historic climax plant community is open grassland with occasional mesquite or shrubs. The composition by weight is 90 percent grasses, 5 percent forbs, 3 percent shrubs, and 2 percent mesquite.

The historic climax plant community is dominated by trichloris, Arizona cottontop, plains lovegrass, and several bristlegrass species, which make up about half of the annual production. Other important perennial grass species include pink pappusgrass, sideoats grama, pinhole bluestem, buffalograss, and curly mesquite. The primary forbs

are awnless bushsunflower, Engelmanndaisy, Mexican sagewort, and velvet bundleflower. Woody shrubs include Carolina wolfberry, desert yaupon, granjeno, vine ephedra, and others. Mesquite is the primary woody tree.

Heavy continuous overgrazing by cattle causes a decrease in the annual production of the decreaser plants including trichloris, Arizona cottontop, and bristlegrass species. These are replaced by increaser plants such as pinhole bluestem, buffalograss, and curly mesquite. If heavy continuous overgrazing continues, Texas grama, threeawns, tumble grass, and annuals invade the site. Brush species such as mesquite, whitebrush, and pricklypear increase in numbers and invade the site.

Clayey Bottomland Ecological Site. The Buchel soil, in map units BcA and BfA, is in the Clayey Bottomland ecological site. The historic plant community is tall grass savannah. The composition by weight is 80 percent grasses, 10 percent forbs, 5 woody shrubs, and 5 percent woody trees.

This site is found in the deep soil drainage areas within the landscape. The historic climax plant community is dominated by trichloris, southwestern bristlegrass, vine mesquite, and buffalograss make up more than 50 percent of the total annual production. Other important grasses include Virginia wildrye, Giant sacaton, plains bristlegrass, and big sandbur. Important forbs include least snoutbean, yellow neptunia, and low ruellia. Woody trees can become quite large include live oak, hackberry, winged elm, and a scattering of other species.

This ecological site is preferred by livestock. The most desirable warm-season grasses and forbs such as trichloris, southwestern bristlegrass, big sandbur, and yellow neptunia can decrease in total annual production under heavy continuous overgrazing. These plants may be replaced by increaser plants such as buffalograss, vine mesquite, and other perennial grasses. If heavy continuous overgrazing by cattle continues for extended, threeawns, annual grasses, and forbs as well as undesirable trees and shrubs invade the site.

Claypan Prairie Ecological Site. The Laparita soil, in map unit LpB, is in the Claypan Prairie ecological site. The historic climax plant community consists of primarily mid and short grasses. The composition by weight is 95 percent grasses and 5 percent forbs.

Southwestern bristlegrass, trichloris, pink pappusgrass, plains bristlegrass, and pinhole bluestem dominated the historic climax plant community making up about half of the total annual production. Other important species on the site include Arizona cottontop, Texas wintergrass, curly mesquite, buffalograss, hooded windmillgrass, vine mesquite, and awnless bushsunflower.

Heavy continuous overgrazing by cattle will result in a decrease in the most desirable plants including southwestern and plains bristlegrass, trichloris, and pink pappusgrass. These species become replaced by buffalograss, curly mesquite, and Texas wintergrass. If heavy continuous overgrazing by cattle continues for an extended period of time, threeawns, tumblegrass, and woody plants including condalias and granjeno invade the site.

Gravelly Ridge Ecological Site. The Hindes and Mata soils, in map units HnD and MaD, are in the Gravelly Ridge ecological site. The historic climax plant community is semi-open grassland of mid grasses interspersed with low growing browse plants. The composition by weight is 65 percent grasses, 10 percent forbs, and 25 percent shrubs. Fire was a key factor in keeping this site from being completely dominated by brush.

The dominant decreaser grasses include tanglehead, green sprangletop, and Arizona cottontop. Other important grasses on the site include sideoats grama, hooded windmillgrass, and lovegrass tridens. Guajillo and blackbrush are the dominant woody plants on the site.

Heavy continuous overgrazing by cattle results in a decrease in the most desirable (decreaser) plants such as Arizona cottontop, sideoats grama, green sprangletop, and tanglehead. These are replaced by increasers such as pinhole bluestem, hooded

windmillgrass, and lovegrass tridens. If retrogression continues, threeawns, tumblegrass, Texas bristlegrass, blackbrush, guajillo, and granjeno increase and invade the site.

Gray Sandy Loam Ecological Site. The Annarose, Choke, Pernitas, and Sarnosa (fig. 17) soils, in map units AnC, CeB, CeC, PmC, PnB, and SeD, are in the Gray Sandy Loam ecological site. The historic climax plant community is a fire climax, open grassland with scattered mesquite, and small shrubs throughout the landscape. The composition by weight is 85 percent grasses, 10 percent forbs, 3 percent woody shrubs, and 2 percent trees.

The historic climax plant community is dominated by decreaser species including trichloris, plains bristlegrass, pink pappusgrass, Arizona cottontop, and tanglehead. These species make up about half of the total annual production of the site. Hooded windmillgrass, lovegrass tridens, vine mesquite, and buffalograss are other important species found on the site.

Heavy continuous overgrazing by cattle causes the decreasers such as trichloris, plain bristlegrass, Arizona cottontop, and tanglehead to disappear from the site. These are replaced by increasers such as buffalograss, hooded windmillgrass, vine mesquite, and lovegrass tridens. If retrogression continues, threeawns, tumblegrass, ragweed, and woody plants increase and invade the site. Huisache can dominate this site upon severe overuse.

Lakebed Ecological Site. The Tiocano soil, in map unit TcA, is in the Lakebed ecological site. The historic climax plant community is open grassland with varying degrees of wetness. The shallow depressed areas vary from 1 to 20 acres in size. The composition by weight is 95 percent grasses and 5 percent forbs.

The predominant grass plant is Hartweg paspalum followed by spike lovegrass, white tridens, knotroot bristlegrass, and switchgrass. Another important grass is buffalograss, which tends to increase as the area becomes drier.

As this site becomes overused through heavy continuous overgrazing by cattle, switchgrass, spike lovegrass, knot root bristlegrass and white tridens are replaced by woody plants. These include mesquite, huisache, and retama, which can form dense canopies.

Loamy Bottomland Ecological Site. The Odem and Sinton soils, in map units OdA, StA, and SxA, are in the Loamy Bottomland ecological site. The historic climax plant community is a fire climax, a tall grass savannah. Trees shade about 20 percent of the ecological site surface. The overstory consists of American elm, live oak, pecan, and various hackberry species. Cool-season grasses and forbs dominate the shaded areas and warm-season grasses dominate the interspaces. The composition by weight is 80 percent grasses, 5 percent forbs, and 15 percent trees.

The historic climax plant community is dominated by switchgrass, trichloris, little bluestem, big sandbur, southwestern bristlegrass, and Virginia wildrye. Other important grasses include buffalograss, Texas wintergrass, pink pappusgrass, sideoats grama, vine mesquite, and plains bristlegrass. Important forbs are Engelmanndaisy, velvet bundle flower, wild petunia, and yellow neptunia.

This site is highly preferred by livestock. Decreaser plants such as trichloris, switchgrass, little bluestem, and big sandbur are reduced by heavy continuous overgrazing and fire suppression. As retrogression continues and woody plants increase, shade tolerant understory plants invade the site.



Figure 17.—Landscape of Sarnosa_fine sandy loam, 3 to 8 percent slopes. The Sarnosa soils are in the Gray Sandy Loam Ecological site.

Loamy Sand Ecological Site. The Papalote soil, in map unit PaB, is in the Loamy Sand ecological site. The historic climax plant community is fire climax open grassland with scattered mesquite and live oak. The composition by weight is 90 percent grasses, 5 percent forbs, 2 percent shrubs, and 3 percent trees.

The predominant grasses on this site are trichloris, little bluestem, tanglehead, plains bristlegrass, and pinhole bluestem. Other important grasses include Arizona cottontop, hooded windmillgrass, crinkleawn, brownseed paspalum, and other perennial grasses. Important forbs include awnless bushsunflower, dotted gayfeather, least snoutbean, and orange zexmenia.

Heavy continuous overgrazing by cattle causes a reduction in the decreaser plants including trichloris, little bluestem, tanglehead, and crinkleawn. These are replaced by increaser plants including hooded windmillgrass, pinhole bluestem, and Pan American balsamscale. If heavy continuous overgrazing continues, threeawns, grassbur, annual forbs, and signalgrass invade the site. Mesquite, granjeno, pricklypear, and lantana increase and also invade this site.

Rolling Blackland Ecological Site. The Coy, Danjer, Eloso, Monteola, and Rosenbrock (fig. 18) soils, in map units CyA, CyB, DnA, DnB, EsA, EsB, MoA, MoB, RoA, RoB, and RrA, are in the Rolling Blackland ecological site.

The historic climax plant community is a fire climax, open prairie. This site is dominated by mid and short grasses. The composition by weight is 90 percent grasses and 5 percent forbs. Woody shrubs were found on this site historically and made up 5 percent of the total composition.

The historic climax plant community is dominated by trichloris, Arizona cottontop, vine mesquite, sideoats grama, and several bristlegrass species. Other important plants include Texas cupgrass, Texas wintergrass, buffalograss, silver bluestem, awnless bushsunflower, dotted gayfeather, least snoutbean, velvet bundle flower, and yellow neptunia.

Heavy continuous overgrazing by cattle causes a decrease in the annual production of the most desirable (decreaser) plants such as trichloris, Texas cupgrass, sideoats grama, and Arizona cottontop. These are replaced by increasers including vine mesquite, sideoats grama, Texas wintergrass, and buffalograss. As retrogression continues, threeawns, red grama, tumble windmillgrass, and undesirable forbs invade the site. Woody plants such as blackbrush, granjeno, and condalias also invade and increase on this site.

Saline Clay Ecological Site. The Cotulla and Esseville soils, in map units CtB, EvA, EvB, EvC, and ExC, are in the Saline Clay ecological site. The historic climax plant community is an open grassland interspersed with a few scattered woody shrubs. The composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent shrubs.

The historic climax plant community is dominated by species including trichloris, vine mesquite, alkali sacaton, and whiplash pappusgrass make up half of the total annual production. Other important species include Arizona cottontop, bristlegrass, buffalograss, and curly mesquite. Forbs consist of velvet bundleflower and yellow neptunia. Texas varilla is small shrub and an indicator of the site.

Heavy continuous overgrazing causes a reduction in the decreaser plants found on the site including trichloris, Arizona cottontop, and plains bristlegrass. These become replaced in the community by increasers such as buffalograss, curly mesquite, vine mesquite, and white tridens. As retrogression continues, threeawns, tobosa, annual forbs, and woody plants invade the site.

Saline Clay Loam Ecological Site. The Campbellton soil, in map units CaB and CaC, is in the Saline Clay Loam ecological site. The historic climax plant community is midgrass dominated open grassland interspersed with scattered woody trees and shrubs. The composition by weight is 90 percent grasses, 5 percent forbs, 5 percent shrubs, and a trace of mesquite.

Grasses including trichloris, pink pappusgrass, plains bristlegrass, plains lovegrass, and pinhole bluestem dominate the site making up two-thirds of the total annual production. Other important plants include Arizona cottontop, buffalograss, curly mesquite, sideoats grama, awnless bushsunflower, and velvet bundleflower. Woody species include blackbrush, Carolina wolfberry, granjeno, guajillo, and vine ephedra.

Heavy continuous overgrazing by cattle causes decreasers such as sideoats grama, trichloris, plains bristlegrass, and awnless bushsunflower to disappear from the plant community. These become replaced by increasers including buffalograss and curly mesquite. If the heavy continuous overgrazing persists, woody plants invade, increase, and grasses including threeawns, red grama, and Texas grama invade.

Sandy Ecological Site. The Nusil and Rhymes soils, in map units NuC and RhC, are in the Sandy ecological site. The historic climax plant community is fire climax, open grassland. An occasional live oak or mesquite is found across the community. Tall grasses dominate this site. The composition by weight is 95 percent grasses and 5 percent forbs.

Yellow Indiangrass, seacoast bluestem, and tanglehead make up three-fourths of the total plant production on this site. Sand dropseed, fringeleaf paspalum, hooded windmillgrass, least snoutbean, and partridge pea are other important plants found on this site. Dove and quail prefer this site due to abundant forbs.

Heavy continuous overgrazing by cattle reduces the decreaser species including yellow Indiangrass, seacoast bluestem, and tanglehead. Increaser plants including hooded windmillgrass, sand dropseed, and fringeleaf paspalum replace the decreasers in the plant community. As retrogression continues, tumble lovegrass, grassbur, pricklypear, croton, and baccharis invade the community.

Sandy Loam Ecological Site. The Goliad and Weesatche soils, in map units GoB, WaB, and WaC, are in the Sandy Loam ecological site. The historic climax plant community is fire climax, open grassland with scattered woody plants. This site is dominated by mid grasses. The total composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent shrubs.

The historic climax plant community is dominated by trichloris, tanglehead, southwestern bristlegrass, Arizona cottontop, and plains bristlegrass. Other important plants include various bluestems, hooded windmillgrass, pink pappusgrass, awnless



Figure 18.—Rangeland on an area of Rosenbrock clay. Rosenbrock soils are in the Rolling Blackland ecological site.

bushsunflower, and dotted gayfeather. Carolina wolfberry, guayacan, Texas kidneywood, and vine ephedra are important shrubs.

Heavy continuous overgrazing by cattle and the lack of fire cause the decreaser plants including trichloris, tanglehead, and plains bristlegrass to disappear from the site. These species are replaced by bluestems and hooded windmillgrass. If retrogression continues, the site becomes invaded by threeawns, annual grasses, forbs, and grassbur. Woody plants including mesquite, white brush, and blackbrush invade and form dense canopies.

Shallow Ecological Site. The Ecleto and Fashing soils, in map units EcB and FaC, are in the Shallow ecological site. The historic plant climax community is fire climax, open prairie consisting of primarily mid grasses with scattered woody plants. The composition by weight is 85 percent grasses, 10 percent forbs, and 5 percent shrubs.

The historic climax plant community is dominated by species including sideoats grama, Arizona cottontop, Texas wintergrass, and pinhole bluestem, which make up half of the total annual production. Other important species include plains lovegrass, hooded windmillgrass, vine mesquite, Texas cupgrass, buffalograss, curly mesquite, and awnless bushsunflower.

Heavy continuous overgrazing by cattle causes a shift in the plant community from a mid grass community to a short grass dominated community. Species like Arizona cottontop, sideoats grama are replaced by curly mesquite, pinhole bluestem, and buffalograss. As retrogression continues, threeawns, red grama, Texas grama, and woody plants such as spiny hackberry, persimmon, lotebush, and huisache invade the site.

Shallow Ridge Ecological Site. The Condido, Olmos (fig. 19), Pavelek, Pettus, Picosa, and Sancajo soils, in map units CnA, OmD, PkB, PkC2, PtC, PvC, and SaD, are in the Shallow Ridge ecological site. The historic climax plant community is grassland with scattered low growing brush such as guajillo, elbowbush, mescalbean, vine ephedra, and Texas kidneywood. An occasional live oak may occur in the site. The composition by weight for this site is 80 percent grasses, 10 percent forbs, 5 percent shrubs, and 5 percent trees.

The historic climax plant community is dominated by mid grasses including Arizona cottontop, pinhole bluestem, plains bristlegrass, and sideoats grama. Taller grasses including trichloris and little bluestem also occur. Other important plants include awnless bushsunflower, Engelmanndaisy, orange zexmenia, Texas kidneywood, and vine ephedra.

Heavy continuous overgrazing by cattle reduces the decreaser plants including trichloris and little bluestem, plains bristlegrass, sideoats grama and awnless bushsunflower. Increasers including pinhole bluestem, curly mesquite, and sand dropseed replace them. As retrogression continues, tumble windmillgrass, red grama, Texas grama, threeawns, cenizo, brazil, and acacia species invade the site.

Shallow Sandy Loam Ecological Site. The Lacoste and Parrita soils, in map units LaB and PcB, are in the Shallow Sandy Loam ecological site. The historic climax plant community is fire climax, open grassland with few scattered woody plants. Numerous forbs are found on this site. The composition by weight is 85 percent grasses, 10 percent forbs, and 5 percent shrubs.

The historic climax plant community is dominated by species including tanglehead, Arizona cottontop, pink pappusgrass, plains bristlegrass, and hooded windmillgrass, which make up half of the total annual production for the site. Other important plants include sand dropseed, slim tridens, silver bluestem, awnless bushsunflower, least snoutbean, orange zexmenia, and velvet bundleflower. Desirable browse on the site includes elbowbush, granjeno, guajillo, guayacan, Texas kidneywood, and vine ephedra.

Heavy continuous overgrazing by cattle reduces the production of decreasers including tanglehead, pink pappusgrass, and plains bristlegrass. Increasers replacing those plants include hooded windmillgrass, slim tridens, and fall witchgrass. As heavy continuous overgrazing continues, threeawns, red grama, Texas grama, and annual forbs as well as blackbrush, condalias, and tasajillo increase and invade on the site.

Sloping Clay Loam Ecological Site. The Schattel soil, in map unit ShC, is in the Sloping Clay Loam ecological site. The historic climax plant community is an open grassland with a scattered blackbrush or woody shrubs. Mid grasses are dominant. The site supports climax forbs, such as awnless bushsunflower, orange zexmenia, and velvet bundleflower. This site is summits and upper side slopes of hills, generally surrounded by the Rolling Blackland Range Site. The soils are slightly and moderately saline at a subsoil depth of about 4 feet; however, salinity levels are not high enough to produce salt-tolerant species. The climax composition by weight is 90 percent grasses, 5 percent forbs, and 5 percent woody plants.

The historic climax plant community is dominated by decreaser grasses such as pink pappusgrass, Arizona cottontop, trichloris, and plains bristlegrass. Other desirable grasses are Texas wintergrass, plains lovegrass, slim tridens, buffalograss, and sideoats grama.

This site is slow to recover after the grass cover is removed through heavy continuous overgrazing, leaving a soil crust that retards rainfall. As retrogression occurs, blackbrush, mesquite, and other mixed-brush and cacti form a dense canopy. Common invaders are red grama, Texas grama, Hall's panicum, and threeawn.

Tight Sandy Loam Ecological Site. The Imogene and Papalote soils, in map units ImA, PbA, and PbB, are in the Tight Sandy Loam ecological site. The historic climax plant community is fire climax, open grassland with scattered mesquite, and low growing browse species. Mid grasses dominate the site. The composition by weight is 92 percent grasses, 5 percent forbs, 2 percent shrubs, and 1 percent trees.

The historic climax plant community is dominated by species including pink pappusgrass, plains bristlegrass, trichloris, sideoats grama, and Arizona cottontop which comprise about half of the total annual production. Other important grasses and forbs include buffalograss, hooded windmillgrass, tanglehead, curly mesquite, awnless bushsunflower, Engelmanndaisy, and orange zexmenia.



Figure 19.—Perennial woody brush on an area of Olmos very gravelly loam, 1 to 8 percent slopes. The Olmos soils are in the Shallow Ridge Ecological site.

Heavy continuous overgrazing by cattle reduces the decreaser plants including trichloris, Arizona cottontop, sideoats grama, and tanglehead in the community. Increasers including buffalograss and hooded windmillgrass replace the decreasers. As retrogression continues, plants such as crotons, threeawns, sandburs, mesquite, condalias, and granjeno invade and increase on the site.

Wildlife Habitat

Jerry Turrentine, Area Biologist, Natural Resources Conservation Service, Uvalde, assisted in this section.

Wildlife is an important resource in Live Oak County. Most of the land that supports wildlife is leased for hunting or is used for hunting by the landowners. With good management of the habitat, many wildlife species in the county are increasing.

Special emphasis and management are improving the wildlife habitat for game species. The major game species include white-tailed deer, bobwhite quail, turkey, scaled quail, white-winged dove, mourning dove, and javelina. Although not a game animal, feral or wild domestic hogs are numerous in some locations and are also hunted. Also present are fox, raccoon, badger, skunk, opossum, nutria, armadillo, cottontail and jackrabbit, squirrel, bats, and numerous rodents. The common predators are the coyote and bobcat. A few mountain lions inhabit the county and are increasing.

Intensive deer management to produce herds of quality bucks is fairly common. Many of the ranches are high fenced to help control their number of deer.

Many ponds are stocked with channel catfish, black bass, and sunfish. Fishing is fair in the Nueces, Atascosa, and Frio Rivers. Water areas receive a high degree of use by animals and birds and provide habitat for amphibians. Several species of reptiles,

including alligators, are increasing, especially in Choke Canyon. The diamondback rattlesnake is the best-known reptile in the county.

Migrating waterfowl use the water areas and cropland in the county as resting sites and feeding areas. They include white-fronted, Canadian and snow geese; widgeon, pintail, gadwall, teal, ring-necked ducks, black-bellied whistling duck, mottled duck, and sandhill cranes. Other birds in the county include numerous species of neotropical migrants, water associated species, and vultures. Many raptors, such as the white-tailed kite, kestrel, neotropical migrants, Swainson's hawk, sharp-shinned hawk, marsh hawk, red-tailed hawk, and Harris hawk, live in or migrate through the survey area.

Successful management of wildlife on any tract of land requires food, cover, and water in suitable combination. If any one of these is lacking, an unfavorable balance among them, or an inadequate distribution of them, can severely limit or account for the absence of, a desired kind of wildlife. Information on the soil provides a valuable tool in creating, improving, or maintaining suitable food, cover, and water for wildlife.

Most wildlife habitat is created or managed by increasing the extent of existing vegetation or improving its quality, by planting suitable vegetation, or by a combination of those measures. The influence that most soils have on plants is known. The influence of others can be reliably inferred from knowledge of the soil characteristics. Soil information also is useful in selecting sites for creating or improving water areas for wildlife habitat.

Proper management of wildlife habitat is important. Areas of corn and grain sorghum provide food for dove and quail. Small grain crops can provide food for geese and sandhill cranes, and deer if suitable cover is nearby. Leaving crop residue on the surface can provide forage for numerous species of wildlife. Small areas of unharvested grain can provide food and cover. Properly managed waterways can provide cover for small mammals and birds. Additional cover can be provided by leaving brush in fence rows. Disking roadsides can greatly improve the food supply available in pastures. Brush in pasture areas provides food and cover. Kleingrass, switchgrass, and blue panicum can provide seed for birds.

Proper management of habitat for rangeland wildlife includes several rangeland improvement practices. Controlled grazing, planned grazing systems, and deferred grazing can increase the amount of forage available to wildlife. A good vegetative cover can provide cover for quail and turkey and fawning areas for deer. Different types of mechanical brush manipulation can create a lot of ground disturbance or merely change the growth form of the brush. If allowed to mature, many grasses can provide seed for dove, quail, and turkey. Brush management is important. If brush is cleared in strips or other patterns, a diversity of food sources for various species of wildlife is created. Adequate herbaceous cover is essential to reduce fawn predation from coyotes. Other measures that can improve the habitat include disking, planting food plots, range seeding, and establishing wildlife water facilities.

In table 8, the soils in the survey area are rated according to their potential for providing habitat for various kinds of wildlife. This information can be used in range management; in planning parks, wildlife refuges, nature study areas, and other developments for wildlife; in selecting soils that are suitable for establishing, improving, or maintaining specific elements of wildlife habitat; and in determining the intensity of management needed for each element of the habitat. The ratings are based mainly on soil characteristics and closely related natural factors of the environment. They do not take into account the present use of soils or distribution of wildlife and people; therefore, on-site inspection is necessary when selecting a site for development of wildlife habitat.

The potential of the soil is rated good, fair, poor, or very poor. A rating of *good* indicates that the element or kind of habitat is easily established, improved, or maintained. Few or no limitations affect management, and satisfactory results can be expected. A rating of *fair* indicates that the element or kind of habitat can be established, improved, or maintained in most places. Moderately intensive management is required for satisfactory results. A rating of *poor* indicates that limitations are severe for the

designated element or kind of habitat. Habitat can be created, improved, or maintained in most places, but management is difficult and must be intensive. A rating of *very poor* indicates that restrictions for the element or kind of habitat are very severe and that unsatisfactory results can be expected. Creating, improving, or maintaining habitat is impractical or impossible.

The elements of wildlife habitat are described in the following paragraphs. *Grain and seed crops* are domestic grains and seed-producing herbaceous plants. Soil properties and features that affect the growth of grain and seed crops are depth of the root zone, texture of the surface layer, available water capacity, wetness, slope, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of grain and seed crops are corn, wheat, oats, and grain sorghum.

Grasses and legumes are perennial grasses and herbaceous legumes. Soil properties and features that affect the growth of grasses and legumes are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, flooding, and slope. Soil temperature and soil moisture are also considerations. Examples of grasses and legumes are coastal bermudagrass, bufflegrass, kleingrass, blue panicum, sorghum alum, clover, and vetch.

Wild herbaceous plants are native or naturally established grasses and forbs, including weeds. Soil properties and features that affect the growth of these plants are depth of the root zone, texture of the surface layer, available water capacity, wetness, surface stoniness, and flooding. Soil temperature and soil moisture are also considerations. Examples of wild herbaceous plants are native panicums, bristlegrass, native sunflowers, Engelmanndaisy, western ragweed, partridge pea, and wooly tidestromia.

Coniferous plants furnish browse and seeds. Soil properties and features that affect the growth of coniferous trees, shrubs, and ground cover are depth of the root zone, available water capacity, and wetness. Examples of coniferous plants are eastern redcedar and juniper.

Shrubs are bushy plants that produce fruit, buds, twigs, bark, and foliage. Soil properties and features that affect the growth of shrubs are depth of the root zone, available water capacity, salinity, and soil moisture. Examples of shrubs are spiny hackberry, guayacan, kidneywood, guajillo, blackbrush, Texas colubrina, mesquite, whitebrush, spiny bumelia, and prickly pear cactus.

Wetland plants are annual and perennial wild herbaceous plants that grow on moist or wet sites. Submerged or floating aquatic plants are excluded. Soil properties and features affecting wetland plants are texture of the surface layer, wetness, reaction, salinity, slope, and surface stoniness. Examples of wetlands plants are smartweed, wild millet, saltgrass, cordgrass, rushes, and sedges.

Shallow water areas have an average depth of less than 5 feet. Some are naturally wet areas. Others are created by dams, levees, or other water-control structures. Soil properties and features affecting shallow water areas are depth to bedrock, wetness, surface stoniness, slope, and permeability. Examples of shallow water areas are marshes, waterfowl feeding areas, and ponds.

The habitat for various kinds of wildlife is described in the following paragraphs. Habitat for openland wildlife consists of cropland, pasture, clearings, and areas that are overgrown with grasses, herbs, shrubs, and vines. These areas produce grain and seed crops, grasses and legumes, and wild herbaceous plants. Wildlife attracted to these areas includes quail, dove, cottontail, jackrabbit, and sandhill crane.

Habitat for wetland wildlife consists of open, marshy or swampy shallow water areas. Some of the wildlife attracted to such areas includes ducks, geese, herons, shore birds, and nutria.

Habitat for rangeland wildlife consists of areas of shrubs and wild herbaceous plants. Wildlife attracted to rangeland includes deer, turkey, quail, javelina, raccoon, and coyote.

Recreation

The soils of the survey area are rated in table 9 and table 10 according to limitations that affect their suitability for recreation. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect the recreational uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

The ratings in the tables are based on restrictive soil features, such as wetness, slope, and texture of the surface layer. Susceptibility to flooding is considered. Not considered in the ratings, but important in evaluating a site, are the location and accessibility of the area, the size and shape of the area and its scenic quality, vegetation, access to water, potential water impoundment sites, and access to public sewer lines. The capacity of the soil to absorb septic tank effluent and the ability of the soil to support vegetation also are important. Soils that are subject to flooding are limited for recreational uses by the duration and intensity of flooding and the season when flooding occurs. In planning recreational facilities, onsite assessment of the height, duration, intensity, and frequency of flooding is essential.

The information in table 9 and table 10 can be supplemented by other information in this survey, for example, interpretations for building site development, construction materials, sanitary facilities, and water management.

Camp areas require site preparation, such as shaping and leveling the tent and parking areas, stabilizing roads and intensively used areas, and installing sanitary facilities and utility lines. Camp areas are subject to heavy foot traffic and some vehicular traffic. The ratings are based on the soil properties that affect the ease of developing camp areas and the performance of the areas after development. Slope, stoniness, and depth to bedrock or a cemented pan are the main concerns affecting the development of camp areas. The soil properties that affect the performance of the areas after development are those that influence trafficability and promote the growth of vegetation, especially in heavily used areas. For good trafficability, the surface of camp areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Picnic areas are subject to heavy foot traffic. Most vehicular traffic is confined to access roads and parking areas. The ratings are based on the soil properties that affect the ease of developing picnic areas and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of picnic areas. For good trafficability, the surface of picnic areas should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that

affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Playgrounds require soils that are nearly level, are free of stones, and can withstand intensive foot traffic. The ratings are based on the soil properties that affect the ease of developing playgrounds and that influence trafficability and the growth of vegetation after development. Slope and stoniness are the main concerns affecting the development of playgrounds. For good trafficability, the surface of the playgrounds should absorb rainfall readily, remain firm under heavy foot traffic, and not be dusty when dry. The soil properties that influence trafficability are texture of the surface layer, depth to a water table, ponding, flooding, permeability, and large stones. The soil properties that affect the growth of plants are depth to bedrock or a cemented pan, permeability, and toxic substances in the soil.

Paths and trails for hiking and horseback riding should require little or no slope modification through cutting and filling. The ratings are based on the soil properties that affect trafficability and erodibility. These properties are stoniness, depth to a water table, ponding, flooding, slope, and texture of the surface layer.

Off-road motorcycle trails require little or no site preparation. They are not covered with surfacing material or vegetation. Considerable compaction of the soil material is likely. The ratings are based on the soil properties that influence erodibility, trafficability, dustiness, and the ease of revegetation. These properties are stoniness, slope, depth to a water table, ponding, flooding, and texture of the surface layer.

Golf course fairways are subject to heavy foot traffic and some light vehicular traffic. Cutting or filling may be required. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer. The suitability of the soil for traps, tees, roughs, and greens is not considered in the ratings.

Hydric Soils

The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils, and wetland hydrology (5)(12)(17)(18). Criteria for each of the characteristics must be met for areas to be identified as wetlands.

Hydric soils are defined by the National Technical Committee for Hydric Soils (NTCHS) as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (6). These soils are either saturated or inundated long enough during the growing season to support the growth and reproduction of hydrophytic vegetation.

The NTCHS definition identifies general soil properties that are associated with wetness. In order to determine whether a specific soil is a hydric soil or nonhydric soil; however, more specific information, such as information about the depth and duration of the water table, is needed. Thus, criteria that identify those estimated soil properties unique to hydric soils have been established (7). The criteria are used to identify a phase of a soil series that normally is also a hydric soil. The criteria used are selected estimated soil properties that are described in "Soil Taxonomy" (16) and "Keys to Soil Taxonomy" (15) and in the "Soil Survey Manual" (14).

If soils are wet enough for a long enough period to be considered hydric, they generally exhibit certain properties that can be observed in the field. These visible properties are indicators of hydric soils. The indicators used to make onsite determinations of hydric soils in this survey area are specified in "Field Indicators of Hydric Soils in the United States" (10).

For information regarding hydric soils in the soil survey area, refer to the USDA Natural Resources Conservation Service Soil Data Mart at http://soildatamart.nrcs.usda.gov.

Engineering

This section provides information for planning land uses related to urban development and to water management. Soils are rated for various uses, and the most limiting features are identified. Ratings are given for building site development, sanitary facilities, construction materials, and water management. The ratings are based on observed performance of the soils and on the data in the tables described under the heading "Soil Properties."

Information in this section is intended for land use planning, for evaluating land use alternatives, and for planning site investigations prior to design and construction. The information, however, has limitations. For example, estimates and other data generally apply only to that part of the soil between the surface and a depth of 5 to 7 feet. Because of the map scale, small areas of different soils may be included within the mapped areas of a specific soil.

The information is not site specific and does not eliminate the need for onsite investigation of the soils or for testing and analysis by personnel experienced in the design and construction of engineering works.

Government ordinances and regulations that restrict certain land uses or impose specific design criteria were not considered in preparing the information in this section. Local ordinances and regulations should be considered in planning, in site selection, and in design.

Soil properties, site features, and observed performance were considered in determining the ratings in this section. During the fieldwork for this soil survey, determinations were made about particle-size distribution, liquid limit, plasticity index, soil reaction, depth to bedrock, hardness of bedrock within 5 to 7 feet of the surface, soil wetness, depth to a water table, ponding, slope, likelihood of flooding, natural soil structure aggregation, and soil density. Data were collected about kinds of clay minerals, mineralogy of the sand and silt fractions, and the kinds of adsorbed cations. Estimates were made for erodibility, permeability, corrosivity, shrink-swell potential, available water capacity, and other behavioral characteristics affecting engineering uses.

This information can be used to evaluate the potential of areas for residential, commercial, industrial, and recreational uses; make preliminary estimates of construction conditions; evaluate alternative routes for roads, streets, highways, pipelines, and underground cables; evaluate alternative sites for sanitary landfills, septic tank absorption fields, and sewage lagoons; plan detailed onsite investigations of soils and geology; locate potential sources of gravel, sand, earthfill, and topsoil; plan drainage systems, irrigation systems, ponds, terraces, and other structures for soil and water conservation; and predict performance of proposed small structures and pavements by comparing the performance of existing similar structures on the same or similar soils.

The information in the tables, along with the soil maps, the soil descriptions, and other data provided in this survey, can be used to make additional interpretations.

Some of the terms used in this soil survey have a special meaning in soil science and are defined in the Glossary.

Building Site Development

Soil properties influence the development of building sites, including the selection of the site, the design of the structure, construction, performance after construction, and maintenance. Table 11 and table 12 show the degree and kind of soil limitations that affect dwellings with and without basements, small commercial buildings, local roads and streets, shallow excavations, and lawns and landscaping.

The ratings in the tables are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect building site development. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Dwellings are single-family houses of three stories or less. For dwellings without basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. For dwellings with basements, the foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of about 7 feet. The ratings for dwellings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility. Compressibility is inferred from the Unified classification. The properties that affect the ease and amount of excavation include depth to a water table, ponding, flooding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Small commercial buildings are structures that are less than three stories high and do not have basements. The foundation is assumed to consist of spread footings of reinforced concrete built on undisturbed soil at a depth of 2 feet or at the depth of maximum frost penetration, whichever is deeper. The ratings are based on the soil properties that affect the capacity of the soil to support a load without movement and on the properties that affect excavation and construction costs. The properties that affect the load-supporting capacity include depth to a water table, ponding, flooding, subsidence, linear extensibility (shrink-swell potential), and compressibility (which is inferred from the Unified classification). The properties that affect the ease and amount of excavation include flooding, depth to a water table, ponding, slope, depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, and the amount and size of rock fragments.

Local roads and streets have an all-weather surface and carry automobile and light truck traffic all year. They have a subgrade of cut or fill soil material; a base of gravel, crushed rock, or soil material stabilized by lime or cement; and a surface of flexible material (asphalt), rigid material (concrete), or gravel with a binder. The ratings are based on the soil properties that affect the ease of excavation and grading and the traffic-supporting capacity. The properties that affect the ease of excavation and grading are depth to bedrock or a cemented pan, hardness of bedrock or a cemented pan, depth to a water table, ponding, flooding, the amount of large stones, and slope. The properties that affect the traffic-supporting capacity are soil strength (as inferred from the AASHTO group index number), subsidence, linear extensibility (shrink-swell potential), the potential for frost action, depth to a water table, and ponding.

Shallow excavations are trenches or holes dug to a maximum depth of 5 or 6 feet for graves, utility lines, open ditches, or other purposes. The ratings are based on the soil properties that influence the ease of digging and the resistance to sloughing. Depth to

bedrock or a cemented pan, hardness of bedrock or a cemented pan, the amount of large stones, and dense layers influence the ease of digging, filling, and compacting. Depth to the seasonal high water table, flooding, and ponding may restrict the period when excavations can be made. Slope influences the ease of using machinery. Soil texture, depth to the water table, and linear extensibility (shrink-swell potential) influence the resistance to sloughing.

Lawns and landscaping require soils on which turf and ornamental trees and shrubs can be established and maintained. Irrigation is not considered in the ratings. The ratings are based on the soil properties that affect plant growth and trafficability after vegetation is established. The properties that affect plant growth are reaction; depth to a water table; ponding; depth to bedrock or a cemented pan; the available water capacity in the upper 40 inches; the content of salts, sodium, or calcium carbonate; and sulfidic materials. The properties that affect trafficability are flooding, depth to a water table, ponding, slope, stoniness, and the amount of sand, clay, or organic matter in the surface layer.

Sanitary Facilities

Table 13 and table 14 show the degree and kind of soil limitations that affect septic tank absorption fields, sewage lagoons, sanitary landfills, and daily cover for landfill. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Septic tank absorption fields are areas in which effluent from a septic tank is distributed into the soil through subsurface tiles or perforated pipe. Only that part of the soil between depths of 24 and 60 inches is evaluated. The ratings are based on the soil properties that affect absorption of the effluent, construction and maintenance of the system, and public health. Permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, and flooding affect absorption of the effluent. Stones and boulders, ice, and bedrock or a cemented pan interfere with installation. Subsidence interferes with installation and maintenance. Excessive slope may cause lateral seepage and surfacing of the effluent in downslope areas.

Some soils are underlain by loose sand and gravel or fractured bedrock at a depth of less than 4 feet below the distribution lines. In these soils the absorption field may not adequately filter the effluent, particularly when the system is new. As a result, the groundwater may become contaminated.

Sewage lagoons are shallow ponds constructed to hold sewage while aerobic bacteria decompose the solid and liquid wastes. Lagoons should have a nearly level floor surrounded by cut slopes or embankments of compacted soil. Nearly impervious soil material for the lagoon floor and sides is required to minimize seepage and contamination of groundwater. Considered in the ratings are slope, permeability, depth to a water table, ponding, depth to bedrock or a cemented pan, flooding, large stones, and content of organic matter.

Soil permeability is a critical property affecting the suitability for sewage lagoons. Most porous soils eventually become sealed when they are used as sites for sewage lagoons. Until sealing occurs, however, the hazard of pollution is severe. Soils that have a permeability rate of more than 2 inches per hour are too porous for the proper functioning of sewage lagoons. In these soils, seepage of the effluent can result in contamination of the groundwater. Ground-water contamination is also a hazard if fractured bedrock is within a depth of 40 inches, if the water table is high enough to raise the level of sewage in the lagoon, or if floodwater overtops the lagoon.

A high content of organic matter is detrimental to proper functioning of the lagoon because it inhibits aerobic activity. Slope, bedrock, and cemented pans can cause construction problems, and large stones can hinder compaction of the lagoon floor. If the lagoon is to be uniformly deep throughout, the slope must be gentle enough and the soil material must be thick enough over bedrock or a cemented pan to make land smoothing practical.

A trench sanitary landfill is an area where solid waste is placed in successive layers in an excavated trench. The waste is spread, compacted, and covered daily with a thin layer of soil excavated at the site. When the trench is full, a final cover of soil material at least 2 feet thick is placed over the landfill. The ratings in the table are based on the soil properties that affect the risk of pollution, the ease of excavation, trafficability, and revegetation. These properties include permeability, depth to bedrock or a cemented pan, depth to a water table, ponding, slope, flooding, texture, stones and boulders, highly organic layers, soil reaction, and content of salts and sodium. Unless otherwise stated, the ratings apply only to that part of the soil within a depth of about 6 feet. For deeper trenches, onsite investigation may be needed.

Hard, nonrippable bedrock, creviced bedrock, or highly permeable strata in or directly below the proposed trench bottom can affect the ease of excavation and the hazard of ground-water pollution. Slope affects construction of the trenches and the movement of surface water around the landfill. It also affects the construction and performance of roads in areas of the landfill.

Soil texture and consistence affect the ease with which the trench is dug and the ease with which the soil can be used as daily or final cover. They determine the workability of the soil when dry and when wet. Soils that are plastic and sticky when wet are difficult to excavate, grade, or compact and are difficult to place as a uniformly thick cover over a layer of refuse.

The soil material used as the final cover for a trench landfill should be suitable for plants. It should not have excess sodium or salts and should not be too acid. The surface layer generally has the best workability, the highest content of organic matter, and the best potential for plants. Material from the surface layer should be stockpiled for use as the final cover.

In an area sanitary landfill, solid waste is placed in successive layers on the surface of the soil. The waste is spread, compacted, and covered daily with a thin layer of soil from a source away from the site. A final cover of soil material at least 2 feet thick is placed over the completed landfill. The ratings in the table are based on the soil properties that affect trafficability and the risk of pollution. These properties include flooding, permeability, depth to a water table, ponding, slope, and depth to bedrock or a cemented pan.

Flooding is a serious problem because it can result in pollution in areas downstream from the landfill. If permeability is too rapid or if fractured bedrock, a fractured cemented pan, or the water table is close to the surface, the leachate can contaminate the water supply. Slope is a consideration because of the extra grading required to maintain roads in the steeper areas of the landfill. Also, leachate may flow along the surface of the soils in the steeper areas and cause difficult seepage problems.

Daily cover for landfill is the soil material that is used to cover compacted solid waste in an area sanitary landfill. The soil material is obtained offsite, transported to the landfill, and spread over the waste. The ratings in the table also apply to the final cover for a landfill. They are based on the soil properties that affect workability, the ease of digging, and the ease of moving and spreading the material over the refuse daily during wet and dry periods. These properties include soil texture, depth to a water table, ponding, rock fragments, slope, depth to bedrock or a cemented pan, reaction, and content of salts, sodium, or lime.

Loamy or silty soils that are free of large stones and excess gravel are the best cover for a landfill. Clayey soils may be sticky and difficult to spread; sandy soils are subject to wind erosion.

Slope affects the ease of excavation and of moving the cover material. Also, it can influence runoff, erosion, and reclamation of the borrow area.

After soil material has been removed, the soil material remaining in the borrow area must be thick enough over bedrock, a cemented pan, or the water table to permit revegetation. The soil material used as the final cover for a landfill should be suitable for plants. It should not have excess sodium, salts, or lime and should not be too acid.

Agricultural Waste Management

Soil properties are important considerations in areas where soils are used as sites for the treatment and disposal of organic waste and wastewater. Selection of soils with properties that favor agricultural waste management can help to prevent environmental damage.

Table 15, table 16, and table 17 show the degree and kind of soil limitations affecting the treatment of agricultural waste, including municipal and food-processing wastewater and effluent from lagoons or storage ponds. Municipal wastewater is the waste stream from a municipality. It contains domestic waste and may contain industrial waste. It may have received primary or secondary treatment. It is rarely untreated sewage. Foodprocessing wastewater results from the preparation of fruits, vegetables, milk, cheese, and meats for public consumption. In places it is high in content of sodium and chloride. In the context of these tables, the effluent in lagoons and storage ponds is from facilities used to treat or store food-processing wastewater or domestic or animal waste. Domestic and food-processing wastewater is very dilute, and the effluent from the facilities that treat or store it commonly is very low in content of carbonaceous and nitrogenous material; the content of nitrogen commonly ranges from 10 to 30 milligrams per liter. The wastewater from animal waste treatment lagoons or storage ponds, however, has much higher concentrations of these materials, mainly because the manure has not been diluted as much as the domestic waste. The content of nitrogen in this wastewater generally ranges from 50 to 2,000 milligrams per liter. When wastewater is applied. checks should be made to ensure that nitrogen, heavy metals, and salts are not added in excessive amounts.

The ratings in the tables are for agricultural waste management systems that not only dispose of and treat organic waste or wastewater but also are beneficial to crops (application of manure and food-processing waste, application of sewage sludge, and disposal of wastewater by irrigation) and for agricultural waste management systems that are designed only for the purpose of wastewater disposal and treatment (overland flow of wastewater, rapid infiltration of wastewater, and slow rate treatment of wastewater).

The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect agricultural waste management. Not limited indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. Somewhat limited indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected.

Very limited indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Application of manure and food-processing waste not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. Manure is the excrement of livestock and poultry, and food-processing waste is damaged fruit and vegetables and the peelings, stems, leaves, pits, and soil particles removed in food preparation. The manure and food-processing waste are either solid, slurry, or liquid. Their nitrogen content varies. A high content of nitrogen limits the application rate. Toxic or otherwise dangerous wastes, such as those mixed with the lye used in food processing, are not considered in the ratings.

The ratings are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the waste is applied, and the method by which the waste is applied. The properties that affect absorption include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, and available water capacity. The properties that affect plant growth and microbial activity include reaction, the sodium adsorption ratio, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Application of sewage sludge not only disposes of waste material but also can improve crop production by increasing the supply of nutrients in the soils where the material is applied. In the context of this table, sewage sludge is the residual product of the treatment of municipal sewage. The solid component consists mainly of cell mass, primarily bacteria cells that developed during secondary treatment and have incorporated soluble organics into their own bodies. The sludge has small amounts of sand, silt, and other solid debris. The content of nitrogen varies. Some sludge has constituents that are toxic to plants or hazardous to the food chain, such as heavy metals and exotic organic compounds, and should be analyzed chemically prior to use.

The content of water in the sludge ranges from about 98 percent to less than 40 percent. The sludge is considered liquid if it is more than about 90 percent water, slurry if it is about 50 to 90 percent water, and solid if it is less than about 50 percent water.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, the rate at which the sludge is applied, and the method by which the sludge is applied. The properties that affect absorption, plant growth, and microbial activity include permeability, depth to a water table, ponding, the sodium adsorption ratio, depth to bedrock or a cemented pan, available water capacity, reaction, salinity, and bulk density. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood that wind erosion or water erosion will transport the waste material from the application site. Stones, cobbles, a water table, ponding, and flooding can hinder the application of sludge. Permanently frozen soils are unsuitable for waste treatment.

Disposal of wastewater by irrigation not only disposes of municipal wastewater and wastewater from food-processing plants, lagoons, and storage ponds but also can improve crop production by increasing the amount of water available to crops. The ratings in the table are based on the soil properties that affect the design, construction, management, and performance of the irrigation system. The properties that affect design

and management include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, slope, and flooding. The properties that affect construction include stones, cobbles, depth to bedrock or a cemented pan, depth to a water table, and ponding. The properties that affect performance include depth to bedrock or a cemented pan, bulk density, the sodium adsorption ratio, salinity, reaction, and the cation-exchange capacity, which is used to estimate the capacity of a soil to adsorb heavy metals. Permanently frozen soils are not suitable for disposal of wastewater by irrigation.

Overland flow of wastewater is a process in which wastewater is applied to the upper reaches of sloped land and allowed to flow across vegetated surfaces, sometimes called terraces, to runoff-collection ditches. The length of the run generally is 150 to 300 feet. The application rate ranges from 2.5 to 16.0 inches per week. It commonly exceeds the rate needed for irrigation of cropland. The wastewater leaves solids and nutrients on the vegetated surfaces as it flows downslope in a thin film. Most of the water reaches the collection ditch, some is lost through evapotranspiration, and a small amount may percolate to the groundwater.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, and the design and construction of the system. Reaction and the cation-exchange capacity affect absorption. Reaction, salinity, and the sodium adsorption ratio affect plant growth and microbial activity. Slope, permeability, depth to a water table, ponding, flooding, depth to bedrock or a cemented pan, stones, and cobbles affect design and construction. Permanently frozen soils are unsuitable for waste treatment.

Rapid infiltration of wastewater is a process in which wastewater applied in a level basin at a rate of 4 to 120 inches per week percolates through the soil. The wastewater may eventually reach the groundwater. The application rate commonly exceeds the rate needed for irrigation of cropland. Vegetation is not a necessary part of the treatment; hence, the basins may or may not be vegetated. The thickness of the soil material needed for proper treatment of the wastewater is more than 72 inches. As a result, geologic and hydrologic investigation is needed to ensure proper design and performance and to determine the risk of ground-water pollution.

The ratings in the table are based on the soil properties that affect the risk of pollution and the design, construction, and performance of the system. Depth to a water table, ponding, flooding, and depth to bedrock or a cemented pan affect the risk of pollution and the design and construction of the system. Slope, stones, and cobbles also affect design and construction. Permeability and reaction affect performance. Permanently frozen soils are unsuitable for waste treatment.

Slow rate treatment of wastewater is a process in which wastewater is applied to land at a rate normally between 0.5 inch and 4.0 inches per week. The application rate commonly exceeds the rate needed for irrigation of cropland. The applied wastewater is treated as it moves through the soil. Much of the treated water may percolate to the groundwater, and some enters the atmosphere through evapotranspiration. The applied water generally is not allowed to run off the surface. Waterlogging is prevented either through control of the application rate or through the use of tile drains, or both.

The ratings in the table are based on the soil properties that affect absorption, plant growth, microbial activity, erodibility, and the application of waste. The properties that affect absorption include the sodium adsorption ratio, depth to a water table, ponding, available water capacity, permeability, depth to bedrock or a cemented pan, reaction, the cation-exchange capacity, and slope. Reaction, the sodium adsorption ratio, salinity, and bulk density affect plant growth and microbial activity. The wind erodibility group, the soil erodibility factor K, and slope are considered in estimating the likelihood of wind erosion or water erosion. Stones, cobbles, a water table, ponding, and flooding can hinder the application of waste. Permanently frozen soils are unsuitable for waste treatment.

Construction Materials

Table 18 and table 19 show information about the soils as potential sources of gravel, sand, topsoil, reclamation material, and roadfill. Normal compaction, minor processing, and other standard construction practices are assumed.

Sand and gravel are natural aggregates suitable for commercial use with a minimum of processing. They are used in many kinds of construction. Specifications for each use vary widely. In table 19, only the likelihood of finding material in suitable quantity is evaluated. The suitability of the material for specific purposes is not evaluated, nor are factors that affect excavation of the material. The properties used to evaluate the soil as a source of sand or gravel are gradation of grain sizes (as indicated by the Unified classification of the soil), the thickness of suitable material, and the content of rock fragments. If the bottom layer of the soil contains sand or gravel, the soil is considered a likely source regardless of thickness. The assumption is that the sand or gravel layer below the depth of observation exceeds the minimum thickness.

The soils are rated *good*, *fair*, or *poor* as potential sources of sand and gravel. A rating of good or fair means that the source material is likely to be in or below the soil. The bottom layer and the thickest layer of the soils are assigned numerical ratings. These ratings indicate the likelihood that the layer is a source of sand or gravel. The number 0.00 indicates that the layer is a poor source. The number 1.00 indicates that the layer is a good source. A number between 0.00 and 1.00 indicates the degree to which the layer is a likely source.

The soils are rated *good*, *fair*, or *poor* as potential sources of topsoil, reclamation material, and roadfill. The features that limit the soils as sources of these materials are specified in the tables. The numerical ratings given after the specified features indicate the degree to which the features limit the soils as sources of topsoil, reclamation material, or roadfill. The lower the number, the greater the limitation.

Reclamation material is used in areas that have been drastically disturbed by surface mining or similar activities. When these areas are reclaimed, layers of soil material or unconsolidated geological material, or both, are replaced in a vertical sequence. The reconstructed soil favors plant growth. The ratings in the table do not apply to quarries and other mined areas that require an offsite source of reconstruction material. The ratings are based on the soil properties that affect erosion and stability of the surface and the productive potential of the reconstructed soil. These properties include the content of sodium, salts, and calcium carbonate; reaction; available water capacity; erodibility; texture; content of rock fragments; and content of organic matter and other features that affect fertility.

Roadfill is soil material that is excavated in one place and used in road embankments in another place. In this table, the soils are rated as a source of roadfill for low embankments, generally less than 6 feet high and less exacting in design than higher embankments.

The ratings are for the whole soil, from the surface to a depth of about 5 feet. It is assumed that soil layers will be mixed when the soil material is excavated and spread.

The ratings are based on the amount of suitable material and on soil properties that affect the ease of excavation and the performance of the material after it is in place. The thickness of the suitable material is a major consideration. The ease of excavation is affected by large stones, depth to a water table, and slope. How well the soil performs in place after it has been compacted and drained is determined by its strength (as inferred from the AASHTO classification of the soil) and linear extensibility (shrink-swell potential).

Topsoil is used to cover an area so that vegetation can be established and maintained. The upper 40 inches of a soil is evaluated for use as topsoil. Also evaluated is the reclamation potential of the borrow area. The ratings are based on the soil properties that affect plant growth; the ease of excavating, loading, and spreading the material; and reclamation of the borrow area. Toxic substances, soil reaction, and the properties that are inferred from soil texture, such as available water capacity and fertility,

affect plant growth. The ease of excavating, loading, and spreading is affected by rock fragments, slope, depth to a water table, soil texture, and thickness of suitable material. Reclamation of the borrow area is affected by slope, depth to a water table, rock fragments, depth to bedrock or a cemented pan, and toxic material.

Water Management

Table 20 and table 21 show information on the soil properties and site features that affect water management. The degree and kind of soil limitations are given for pond reservoir areas; embankments, dikes, and levees; and aquifer-fed excavated ponds. The ratings are both verbal and numerical. Rating class terms indicate the extent to which the soils are limited by all of the soil features that affect these uses. *Not limited* indicates that the soil has features that are very favorable for the specified use. Good performance and very low maintenance can be expected. *Somewhat limited* indicates that the soil has features that are moderately favorable for the specified use. The limitations can be overcome or minimized by special planning, design, or installation. Fair performance and moderate maintenance can be expected. *Very limited* indicates that the soil has one or more features that are unfavorable for the specified use. The limitations generally cannot be overcome without major soil reclamation, special design, or expensive installation procedures. Poor performance and high maintenance can be expected.

Numerical ratings in the tables indicate the severity of individual limitations. The ratings are shown as decimal fractions ranging from 0.01 to 1.00. They indicate gradations between the point at which a soil feature has the greatest negative impact on the use (1.00) and the point at which the soil feature is not a limitation (0.00).

Pond reservoir areas hold water behind a dam or embankment. Soils best suited to this use have low seepage potential in the upper 60 inches. The seepage potential is determined by the permeability of the soil and the depth to fractured bedrock or other permeable material. The underlying material is not rated and should be evaluated during an onsite investigation. Excessive slope can affect the storage capacity of the reservoir area.

Embankments, dikes, and levees are raised structures of soil material, generally less than 20 feet high, constructed to impound water or to protect land against overflow. Embankments that have zoned construction (core and shell) are not considered. In this table, the soils are rated as a source of material for embankment fill. The ratings apply to the soil material below the surface layer to a depth of about 5 feet. It is assumed that soil layers will be uniformly mixed and compacted during construction.

The ratings do not indicate the ability of the natural soil to support an embankment. Soil properties to a depth even greater than the height of the embankment can affect performance and safety of the embankment. Generally, deeper onsite investigation is needed to determine these properties.

Soil material in embankments must be resistant to seepage, piping, and erosion and have favorable compaction characteristics. Unfavorable features include less than 5 feet of suitable material and a high content of stones or boulders, organic matter, or salts or sodium. A high water table affects the amount of usable material. It also affects trafficability.

Aquifer-fed excavated ponds are pits or dugouts that extend to a ground-water aquifer or to a depth below a permanent water table. Excluded are ponds that are fed only by surface runoff and embankment ponds that impound water 3 feet or more above the original surface. Excavated ponds are affected by depth to a permanent water table, permeability of the aquifer, and quality of the water as inferred from the salinity of the soil. Depth to bedrock and the content of large stones affect the ease of excavation.

Grassed waterways are natural or constructed channels, generally broad and shallow, that conduct surface water to outlets at a nonerosive velocity. Large stones, wetness, slope, and depth to bedrock affect the construction of grassed waterways. A hazard of wind erosion, low available water capacity, restricted rooting depth, toxic

substances such as salts and sodium, and restricted permeability adversely affect the growth and maintenance of the grass after construction.

Terraces and diversions are embankments or a combination of channels and ridges constructed across a slope to control erosion and conserve moisture by intercepting runoff. Slope, wetness, large stones, and depth to bedrock affect the construction of terraces and diversions. A restricted rooting depth, a severe hazard of wind erosion or water erosion, an excessively coarse texture, and restricted permeability adversely affect maintenance.

Soil Properties

Data relating to soil properties are collected during the course of the soil survey. Soil properties are ascertained by field examination of the soils and by laboratory index testing of some benchmark soils. Established standard procedures are followed. During the survey, many shallow borings are made and examined to identify and classify the soils and to delineate them on the soil maps. Samples are taken from some typical profiles and tested in the laboratory to determine particle-size distribution, plasticity, and compaction characteristics.

Estimates of soil properties are based on field examinations, on laboratory tests of samples from the survey area, and on laboratory tests of samples of similar soils in nearby areas. Tests verify field observations, verify properties that cannot be estimated accurately by field observation, and help to characterize key soils.

The estimates of soil properties are shown in tables. They include engineering properties, physical and chemical properties, and pertinent soil and water features.

Engineering Index Properties

Table 22 gives the engineering classifications and the range of index properties for the layers of each soil in the survey area.

Depth to the upper and lower boundaries of each layer is indicated.

Texture is given in the standard terms used by the U.S. Department of Agriculture. These terms are defined according to percentages of sand, silt, and clay in the fraction of the soil that is less than 2 millimeters across. "Loam," for example, is soil that is 7 to 27 percent clay, 28 to 50 percent silt, and less than 52 percent sand. If the content of particles coarser than sand is 15 percent or more, an appropriate modifier is added, for example, "gravelly." Textural terms are defined in the Glossary.

Classification of the soils is determined according to the Unified soil classification system (2) and the system adopted by the American Association of State Highway and Transportation Officials (1).

The Unified system classifies soils according to properties that affect their use as construction material. Soils are classified according to particle-size distribution of the fraction less than 3 inches across and according to plasticity index, liquid limit, and organic matter content. Sandy and gravelly soils are identified as GW, GP, GM, GC, SW, SP, SM, and SC; silty and clayey soils as ML, CL, OL, MH, CH, and OH; and highly organic soils as PT. Soils exhibiting engineering properties of two groups can have a dual classification, for example, CL-ML.

The AASHTO system classifies soils according to those properties that affect roadway construction and maintenance. In this system, the fraction of a mineral soil that is less than 3 inches across is classified in one of seven groups from A-1 through A-7 on the basis of particle-size distribution, liquid limit, and plasticity index. Soils in group A-1 are coarse grained and low in content of fines (silt and clay). At the other extreme, soils in group A-7 are fine grained. Highly organic soils are classified in group A-8 on the basis of visual inspection.

If laboratory data are available, the A-1, A-2, and A-7 groups are further classified as A-1-a, A-1-b, A-2-4, A-2-5, A-2-6, A-2-7, A-7-5, or A-7-6. As an additional refinement, the suitability of a soil as subgrade material can be indicated by a group index number.

Group index numbers range from 0 for the best subgrade material to 20 or higher for the poorest.

Rock fragments larger than 10 inches across and 3 to 10 inches across are indicated as a percentage of the total soil on a dry-weight basis. The percentages are estimates determined mainly by converting volume percentage in the field to weight percentage.

Percentage (of soil particles) passing designated sieves is the percentage of the soil fraction less than 3 inches across based on an ovendry weight. The sieves, numbers 4, 10, 40, and 200 (USA Standard Series), have openings of 4.76, 2.00, 0.420, and 0.074 millimeters, respectively. Estimates are based on laboratory tests of soils sampled in the survey area and in nearby areas and on estimates made in the field.

Liquid limit and plasticity index (Atterberg limits) indicate the plasticity characteristics of a soil. The estimates are based on test data from the survey area or from nearby areas and on field examination.

The estimates of particle-size distribution, liquid limit, and plasticity index are generally rounded to the nearest 5 percent. Thus, if the ranges of gradation and Atterberg limits extend a marginal amount (1 or 2 percentage points) across classification boundaries, the classification in the marginal zone is generally omitted in the table.

Physical Soil Properties

Table 23 shows estimates of some physical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Clay as a soil separate consists of mineral soil particles that are less than 0.002 millimeter across. In table 24, the estimated clay content of each soil layer is given as a percentage, by weight, of the soil material that is less than 2 millimeters across.

The content of sand, silt, and clay affects the physical behavior of a soil. Particle size is important for engineering and agronomic interpretations, for determination of soil hydrologic qualities, and for soil classification.

The amount and kind of clay affect the fertility and physical condition of the soil and the ability of the soil to adsorb cations and to retain moisture. They influence shrink-swell potential, permeability, plasticity, the ease of soil dispersion, and other soil properties. The amount and kind of clay in a soil also affect tillage and earthmoving operations.

Moist bulk density is the weight of soil (ovendry) per unit volume. Volume is measured when the soil is at field moisture capacity, that is, the moisture content at 1/3- or 1/10-bar (33kPa or 10kPa) moisture tension. Weight is determined after the soil is dried at 105 degrees C. In the table, the estimated moist bulk density of each soil horizon is expressed in grams per cubic centimeter of soil material that is less than 2 millimeters across. Bulk density data are used to compute shrink-swell potential, available water capacity, total pore space, and other soil properties. The moist bulk density of a soil indicates the pore space available for water and roots. Depending on soil texture, a bulk density of more than 1.4 can restrict water storage and root penetration. Moist bulk density is influenced by texture, kind of clay, content of organic matter, and soil structure.

Permeability (K_{sat}) refers to the ability of a soil to transmit water or air. The term "permeability," as used in soil surveys, indicates saturated hydraulic conductivity (K_{sat}). The estimates in the table indicate the rate of water movement, in inches per hour, when the soil is saturated. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Permeability is considered in the design of soil drainage systems and septic tank absorption fields.

Available water capacity refers to the quantity of water that the soil is capable of storing for use by plants. The capacity for water storage is given in inches of water per inch of soil for each soil layer. The capacity varies, depending on soil properties that affect retention of water. The most important properties are the content of organic matter,

soil texture, bulk density, and soil structure. Available water capacity is an important factor in the choice of plants or crops to be grown and in the design and management of irrigation systems. Available water capacity is not an estimate of the quantity of water actually available to plants at any given time.

Linear extensibility refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. The volume change is reported in the table as percent change for the whole soil. Volume change is influenced by the amount and type of clay minerals in the soil.

Linear extensibility is used to determine the shrink-swell potential of soils. The shrink-swell potential is low if the soil has a linear extensibility of less than 3 percent; moderate if 3 to 6 percent; high if 6 to 9 percent; and very high if more than 9 percent. If the linear extensibility is more than 3, shrinking and swelling can cause damage to buildings, roads, and other structures and to plant roots. Special design commonly is needed.

Organic matter is the plant and animal residue in the soil at various stages of decomposition. In table 24, the estimated content of organic matter is expressed as a percentage, by weight, of the soil material that is less than 2 millimeters across.

The content of organic matter in a soil can be maintained by returning crop residue to the soil. Organic matter has a positive effect on available water capacity, water infiltration, soil organism activity, and tilth. It is a source of nitrogen and other nutrients for crops and soil organisms.

Erosion factors are shown in table 24 as the K factor (Kw and Kf) and the T factor. Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of several factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and permeability. Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

Erosion factor Kw indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

Erosion factor Kf indicates the erodibility of the fine-earth fraction, or the material less than 2 millimeters in size.

Erosion factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity over a sustained period. The rate is in tons per acre per year.

Wind erodibility groups are made up of soils that have similar properties affecting their susceptibility to wind erosion in cultivated areas. The soils assigned to group 1 are the most susceptible to wind erosion, and those assigned to group 8 are the least susceptible. The groups are as follows:

- 1. Coarse sands, sands, fine sands, and very fine sands.
- 2. Loamy coarse sands, loamy sands, loamy fine sands, loamy very fine sands, ash material, and sapric soil material.
 - 3. Coarse sandy loams, sandy loams, fine sandy loams, and very fine sandy loams.
 - 4L. Calcareous loams, silt loams, clay loams, and silty clay loams.
- 4. Clays, silty clays, noncalcareous clay loams, and silty clay loams that are more than 35 percent clay.
- 5. Noncalcareous loams and silt loams that are less than 20 percent clay and sandy clay loams, sandy clays, and hemic soil material.
- 6. Noncalcareous loams and silt loams that are more than 20 percent clay and noncalcareous clay loams that are less than 35 percent clay.
- 7. Silts, noncalcareous silty clay loams that are less than 35 percent clay, and fibric soil material.

8. Soils that are not subject to wind erosion because of rock fragments on the surface or because of surface wetness.

Wind erodibility index is a numerical value indicating the susceptibility of soil to wind erosion, or the tons per acre per year that can be expected to be lost to wind erosion. There is a close correlation between wind erosion and the texture of the surface layer, the size and durability of surface clods, rock fragments, organic matter, and a calcareous reaction. Soil moisture and frozen soil layers also influence wind erosion.

Chemical Soil Properties

Table 24 shows estimates of some chemical characteristics and features that affect soil behavior. These estimates are given for the layers of each soil in the survey area. The estimates are based on field observations and on test data for these and similar soils.

Depth to the upper and lower boundaries of each layer is indicated.

Cation-exchange capacity is the total amount of extractable bases that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. Soils having a low cation-exchange capacity hold fewer cations and may require more frequent applications of fertilizer than soils having a high cation-exchange capacity. The ability to retain cations reduces the hazard of groundwater pollution.

Soil reaction is a measure of acidity or alkalinity. The pH of each soil horizon is based on many field tests. For many soils, values have been verified by laboratory analyses. Soil reaction is important in selecting crops and other plants, in evaluating soil amendments for fertility and stabilization, and in determining the risk of corrosion.

Calcium carbonate equivalent is the percent of carbonates, by weight, in the fraction of the soil less than 2 millimeters in size. The availability of plant nutrients is influenced by the amount of carbonates in the soil. Incorporating nitrogen fertilizer into calcareous soils helps to prevent nitrite accumulation and ammonium-N volatilization.

Gypsum is expressed as a percent, by weight, of hydrated calcium sulfates in the fraction of the soil less than 20 millimeters in size. Gypsum is partially soluble in water. Soils that have a high content of gypsum may collapse if the gypsum is removed by percolating water.

Salinity is a measure of soluble salts in the soil at saturation. It is expressed as the electrical conductivity of the saturation extract, in millimhos per centimeter at 25 degrees C. Estimates are based on field and laboratory measurements at representative sites of nonirrigated soils. The salinity of irrigated soils is affected by the quality of the irrigation water and by the frequency of water application. Hence, the salinity of soils in individual fields can differ greatly from the value given in the table. Salinity affects the suitability of a soil for crop production, the stability of soil if used as construction material, and the potential of the soil to corrode metal and concrete.

Sodium adsorption ratio (SAR) is a measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration. Soils that have SAR values of 13 or more may be characterized by an increased dispersion of organic matter and clay particles, reduced permeability and aeration, and a general degradation of soil structure.

Water Features

Table 25 shows estimates of various water features. The estimates are used in land use planning that involves engineering considerations.

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not

protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The four hydrologic soil groups are:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep and very deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep to very deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

The *months* in the table indicate the portion of the year in which the feature is most likely to be a concern.

Water table refers to a saturated zone in the soil. Table 25 indicates, by month, depth to the top (upper limit) and base (lower limit) of the saturated zone in most years. Estimates of the upper and lower limits are based mainly on observations of the water table at selected sites and on evidence of a saturated zone, namely grayish colors or mottles (redoximorphic features) in the soil. A saturated zone that lasts for less than a month is not considered a water table.

Ponding is standing water in a closed depression. Unless a drainage system is installed, the water is removed only by percolation, transpiration, or evaporation. Table 25 indicates surface water depth and the duration and frequency of ponding. Duration is expressed as very brief if less than 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days. Frequency is expressed as none, rare, occasional, and frequent. None means that ponding is not probable; rare that it is unlikely but possible under unusual weather conditions (the chance of ponding is nearly 0 percent to 5 percent in any year); occasional that it occurs, on the average, once or less in 2 years (the chance of ponding is 5 to 50 percent in any year); and frequent that it occurs, on the average, more than once in 2 years (the chance of ponding is more than 50 percent in any year).

Flooding is the temporary inundation of an area caused by overflowing streams, by runoff from adjacent slopes, or by tides. Water standing for short periods after rainfall or snowmelt is not considered flooding, and water standing in swamps and marshes is considered ponding rather than flooding.

Duration and frequency are estimated. Duration is expressed as extremely brief if 0.1 hour to 4 hours, very brief if 4 hours to 2 days, brief if 2 to 7 days, long if 7 to 30 days, and very long if more than 30 days. Frequency is expressed as none, very rare, rare, occasional, frequent, and very frequent. None means that flooding is not probable; very rare that it is very unlikely but possible under extremely unusual weather conditions (the chance of flooding is less than 1 percent in any year); rare that it is unlikely but possible under unusual weather conditions (the chance of flooding is 1 to 5 percent in any year); occasional that it occurs infrequently under normal weather conditions (the chance of flooding is 5 to 50 percent in any year); frequent that it is likely to occur often under normal weather conditions (the chance of flooding is more than 50 percent in any year but is less than 50 percent in all months in any year); and very frequent that it is likely to

occur very often under normal weather conditions (the chance of flooding is more than 50 percent in all months of any year).

The information is based on evidence in the soil profile, namely thin strata of gravel, sand, silt, or clay deposited by floodwater; irregular decrease in organic matter content with increasing depth; and little or no horizon development.

Also considered is local information about the extent and levels of flooding and the relation of each soil on the landscape to historic floods. Information on the extent of flooding based on soil data is less specific than that provided by detailed engineering surveys that delineate flood-prone areas at specific flood frequency levels.

Soil Features

Table 26 shows estimates of various soil features. The estimates are used in land use planning that involves engineering considerations.

A restrictive layer is a nearly continuous layer that has one or more physical, chemical, or thermal properties that significantly impede the movement of water and air through the soil or that restricts roots or otherwise provides an unfavorable root environment. Examples are bedrock, cemented layers, dense layers, and frozen layers. The table indicates the hardness and thickness of the restrictive layer, both of which significantly affect the ease of excavation. Depth to top is the vertical distance from the soil surface to the upper boundary of the restrictive layer.

Risk of corrosion pertains to potential soil-induced electrochemical or chemical action that corrodes or weakens uncoated steel or concrete. The rate of corrosion of uncoated steel is related to such factors as soil moisture, particle-size distribution, acidity, and electrical conductivity of the soil. The rate of corrosion of concrete is based mainly on the sulfate and sodium content, texture, moisture content, and acidity of the soil. Special site examination and design may be needed if the combination of factors results in a severe hazard of corrosion. The steel or concrete in installations that intersect soil boundaries or soil layers is more susceptible to corrosion than the steel or concrete in installations that are entirely within one kind of soil or within one soil layer.

For uncoated steel, the risk of corrosion, expressed as *low*, *moderate*, or *high*, is based on soil drainage class, total acidity, electrical resistivity near field capacity, and electrical conductivity of the saturation extract.

For concrete, the risk of corrosion also is expressed as *low*, *moderate*, or *high*. It is based on soil texture, acidity, and amount of sulfates in the saturation extract.

Physical and Chemical Analyses of Selected Soils

The results of physical analysis of several typical pedons in the survey area are given in table 27, the results of chemical analysis in table 28, and mineralogy results in table 29. The data are for soils sampled at carefully selected sites. Unless otherwise indicated, the pedons are typical of the series. They are described in the section "Soil Series and Their Morphology." Soil samples were analyzed by USDA-NRCS, National Soil Survey Laboratory, Lincoln, Nebraska.

Most determinations, except those for grain-size analysis and bulk density, were made on soil material smaller than 2 millimeters across. Measurements reported as percent or quantity of unit weight that was calculated on an ovendry basis. The methods used in obtaining the data are indicated in the list that follows. The codes in parentheses refer to published methods (19).

Sand—(0.05-2.0 mm fraction) weight percentages of material less than 2 mm (3A1). Silt—(0.002-0.05 mm fraction) pipette extraction, weight percentages of all material less than 2 mm (3A1).

Clay—(fraction less than 0.002 mm) pipette extraction, weight percentages of material less than 2 mm (3A1).

Water retained—pressure extraction, percentage of ovendry weight of less than 2 mm material; 1/3- or 1/10-bar (4B1), 15 bars (4B2).

Bulk density—of less than 2 mm material, saran-coated clods field moist (4A1a), 1/3-bar (4A1d), ovendry (4A1h).

Linear extensibility—change in clod dimension based on whole soil (4D).

Organic carbon—wet combustion. Walkley-Black modified acid-dichromate, ferric sulfate titration (6A1c).

Extractable cations—ammonium acetate pH 7.0, ICP; calcium (6N2i), magnesium (6O2h), sodium (6P2f), potassium (6Q2f).

Cation-exchange capacity—sum of cations (5A3a).

Base saturation—ammonium acetate, pH 7.0 (5C1).

Reaction (pH)—1:1 water dilution (8C1f).

Electrical conductivity—saturation extract (8A3a).

Sodium adsorption ratio (5E).

X-Ray Diffraction (7A2i)

Classification of the Soils

The system of soil classification used by the National Cooperative Soil Survey has six categories (18,19). Beginning with the broadest, these categories are the order, suborder, great group, subgroup, family, and series. Classification is based on soil properties observed in the field or inferred from those observations or from laboratory measurements. Table 30 shows the classification of the soils in the survey area. The categories are defined in the following paragraphs.

ORDER. Twelve soil orders are recognized. The differences among orders reflect the dominant soil-forming processes and the degree of soil formation. Each order is identified by a word ending in oll. An example is Mollisol.

SUBORDER. Each order is divided into suborders primarily on the basis of properties that influence soil genesis and are important to plant growth or properties that reflect the most important variables within the orders. The last syllable in the name of a suborder indicates the order. An example is Ustoll (Ust, meaning arid, plus oll, from Mollisol).

GREAT GROUP. Each suborder is divided into great groups on the basis of close similarities in kind, arrangement, and degree of development of pedogenic horizons; soil moisture and temperature regimes; type of saturation; and base status. Each great group is identified by the name of a suborder and by a prefix that indicates a property of the soil. An example is Argiustolls (Argi, meaning clay illuviation, plus ustoll, the suborder of the Mollisols that has a ustic moisture regime).

SUBGROUP. Each great group has a typic subgroup. Other subgroups are intergrades or extragrades. The typic subgroup is the central concept of the great group; it is not necessarily the most extensive. Intergrades are transitions to other orders, suborders, or great groups. Extragrades have some properties that are not representative of the great group but do not indicate transitions to any other taxonomic class. Each subgroup is identified by one or more adjectives preceding the name of the great group. The adjective Typic identifies the subgroup that typifies the great group. An example is Typic Argiustolls.

FAMILY. Families are established within a subgroup on the basis of physical and chemical properties and other characteristics that affect management. Generally, the properties are those of horizons below plow depth where there is much biological activity. Among the properties and characteristics considered are particle-size class, mineralogy class, cation-exchange activity class, soil temperature regime, soil depth, and reaction class. A family name consists of the name of a subgroup preceded by terms that indicate soil properties. An example is fine-loamy, mixed, active, mesic Typic fine-loamy, mixed, superactive, hyperthermic Typic Argiustolls.

SERIES. The series consists of soils within a family that have horizons similar in color, texture, structure, reaction, consistence, mineral and chemical composition, and arrangement in the profile. An example is the Weesatche series.

Soil Series and Their Morphology

In this section, each soil series recognized in the survey area is described. Characteristics of the soil and the material in which it formed are identified for each series. A pedon, a small three-dimensional area of soil, which is typical of the series in the survey area, is described. The detailed description of each soil horizon follows standards in the "Soil Survey Manual" (14). Many of the technical terms used in the descriptions are defined in "Soil Taxonomy" (16) and in "Keys to Soil Taxonomy" (15).

Unless otherwise indicated, colors in the descriptions are for dry soil. Following the pedon description is the range of important characteristics of the soils in the series.

Annarose Series

Depth class: Deep

Drainage class: Well drained Permeability: Moderate Landform: Ridge or interfluve

Parent material: Noncemented sandstone

Slope range: 2 to 5 percent

Associated soils: Pernitas, Pettus, Weesatche

Taxonomic class: Coarse-loamy, mixed, superactive, hyperthermic Aridic Calciustepts

Typical Pedon

Annarose fine sandy loam (fig. 20), 2 to 5 percent slopes; in Live Oak County, Texas, from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, 2.4 miles north on U.S. Highway 281, 12.6 miles southwest on Farm Road 889, 0.4 mile southeast on private road, and 100 feet east in rangeland; USGS Clegg NE, Texas topographic quadrangle; lat. 28 degrees 12 minutes 42 seconds N. and long. 98 degrees 17 minutes 32 seconds W.

- A—0 to 9 inches; pale brown (10YR 6/3) fine sandy loam; brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; 80 percent of surface has massive crust about ¼ inch thick with 5 percent cover of lichen growth; hard friable; common fine, few medium and coarse roots; common fine and few medium tubular pores; few snail shell fragments; common wormcasts; violently effervescent; moderately alkaline; clear smooth boundary.
- Bw1—9 to 16 inches; light yellowish brown (10YR 6/4) sandy clay loam; yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable; common medium roots; common very fine, fine, and medium tubular pores; few snail shell fragments; few rounded chert fragments; few films and threads of calcium carbonate; common wormcasts; violently effervescent; moderately alkaline; clear smooth boundary.
- Bw2—16 to 25 inches; light yellowish brown (10YR 6/4) sandy clay loam; yellowish brown (10YR 5/4) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable; few fine and medium roots; common very fine and fine, and few medium and coarse tubular pores; few rounded weakly cemented chalk fragments and few rounded chert fragments; few fine threads of calcium carbonate; few wormcasts; violently effervescent; moderately alkaline; clear wavy boundary.
- Bk1—25 to 35 inches; very pale brown (10YR 7/3) sandy clay loam; light yellowish brown (10YR 6/4) moist; weak medium prismatic structure parting to weak fine and medium subangular blocky; hard, friable; few fine and medium roots; many very fine and fine, and common medium tubular pores; few wormcasts; few rounded weakly cemented chalk fragments and few rounded chert fragments; 10 percent by volume coatings, threads, concretions, and masses of calcium carbonate; violently effervescent; moderately alkaline, clear wavy boundary.
- Bk2—35 to 43 inches; very pale brown (10YR 7/3) fine sandy loam; light yellowish brown (10YR 6/4) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; hard, firm; few fine and medium roots; many very fine and fine, and common medium tubular pores; few wormcasts; common rounded weakly cemented chalk fragments; 15 percent by volume coatings, threads, concretions, and masses of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.

- BCk—43 to 50 inches; very pale brown (10YR 7/3) and very pale brown (10YR 8/2) fine sandy loam; light yellowish brown (10YR 6/4) and light gray (10YR 7/2) moist; weak medium and coarse prismatic structure parting to weak medium subangular blocky; slightly hard, very friable; common fine and few medium and coarse roots; common fine and few medium tubular pores; common wormcasts; 10 percent by volume coatings, threads, masses, and concretions of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.
- Cd1—50 to 69 inches; very pale brown (10YR 8/2) noncemented sandstone, and about 10 percent very pale brown (10YR 7/3) fine sandy loam; light yellowish brown (10YR 6/4) moist; massive; hard, firm; few very fine and fine roots in fractures; common very fine and fine tubular pores; fractures are spaced 5 to 15 inches apart; 8 percent by volume threads and masses of calcium carbonate; 80 percent of matrix is violently effervescent with 20 percent noneffervescent; moderately alkaline; gradual wavy boundary.
- Cd2—69 to 80 inches; very pale brown (10YR 8/2) noncemented sandstone, and about 10 percent very pale brown (10YR 7/3) fine sandy loam along fractures; light gray (10YR 7/2), and light yellowish brown (10YR 6/4) moist; massive; hard, firm; few very fine and fine roots in fractures; common very fine and fine tubular pores; fractures are spaced 10 to 20 inches apart; 5 percent by volume threads and masses of calcium carbonate; 60 percent of matrix is violently effervescent with 40 percent noneffervescent; moderately alkaline.

Range in Characteristics

Solum thickness: 40 to 60 inches
Depth to sandstone: 40 to 60 inches
Depth to carbonates: 10 to 30 inches
Content of rock fragments: Less than 10 percent
A horizon:
Hue—10YR

Value—4 to 6

Chroma—2 or 3

Texture—fine sandy loam

Bw horizon:

Hue-10YR

Value—4 to 6

Chroma-2 to 4

Texture—fine sandy loam, loam, or sandy clay loam

Bk horizon:

Hue—10YR

Value—6 or 7

Chroma—3 or 4

Texture—fine sandy loam, loam, or sandy clay loam

BCk horizon:

Hue—10YR

Value—7 or 8

Chroma—2 or 3

Texture—fine sandy loam, loam, or sandy clay loam

Cd horizon:

Hue—10YR

Value—7 or 8

Chroma—2 or 3

Texture—noncemented sandstone with textures of loamy fine sand or fine sandy loam



Figure 20.—Profile of Annarose fine sandy loam, 2 to 5 percent slopes. Noticeable increases of calcium carbonate occur at about 25 inches.

Buchel Series

Depth class: Very deep

Drainage class: Moderately well

Permeability: Very slow Landform: Flood plain

Parent material: Clayey alluvium Slope range: 0 to 1 percent Associated soils: Sinton, Odem

Taxonomic class: Fine, smectitic, hyperthermic Typic Haplusterts

Typical Pedon

Buchel clay, 0 to 1 percent slopes, occasionally flooded (fig. 21); in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, 10.0 miles north on U.S. Highway 281, 0.4 mile east on Texas Highway 72, 1.0 mile east on county road, 1.0 mile south on private farm road and 100 feet east in cropland; USGS Three Rivers, Texas topographic quadrangle; lat. 28 degrees 27 minutes 26 seconds N. and long. 98 degrees 9 minutes 38 seconds W.

Ap—0 to 8 inches; very dark gray (10YR 3/1) clay; black (10YR 2/1) moist; weak fine subangular blocky and granular structure; extremely hard, very firm; common fine and few medium roots; few very fine and fine tubular pores; few snail shell

- fragments; few fine quartz pebbles; cracks approximately ¼ inch wide and 1 foot apart extend to a depth of 6 feet; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bss1—8 to 22 inches; very dark gray (10YR 3/1) clay; black (10YR 2/1) moist; moderate fine and medium angular blocky structure; very hard, very firm; common fine and few medium roots; common very fine and fine tubular pores; few lenses of sand along cracks; common pressure surfaces; common intersecting slickensides; common distinct organic coats on vertical and horizontal faces of peds; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bss2—22 to 32 inches; very dark gray (10YR 3/1) clay; black (10YR 2/1) moist; moderate medium angular blocky structure; very hard, very firm; common fine and few medium roots; common very fine and fine tubular pores; few lenses of sand along cracks; common pressure surfaces; common intersecting slickensides; common distinct organic coats on vertical and horizontal faces of peds; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bss3—32 to 42 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; very hard, very firm; few fine and medium roots; few very fine and fine tubular pores; few lenses of sand along cracks; common pressure surfaces; common intersecting slickensides; common distinct organic coats on vertical and horizontal faces of peds; strongly effervescent; moderately alkaline; clear wavy boundary.
- Bss4—42 to 63 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; very hard, very firm; few fine and medium roots; few very fine and fine tubular pores; few lenses of sand along cracks; common pressure surfaces; common intersecting slickensides; common distinct organic coats on vertical and horizontal faces of peds; strongly effervescent; moderately alkaline; clear wavy boundary.
- Bss5—63 to 74 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; weak medium subangular blocky structure; hard, firm; few fine and medium roots; few very fine and fine tubular pores; few lenses of sand along cracks; common pressure surfaces; common intersecting slickensides; common distinct organic coats on vertical and horizontal faces of peds; strongly effervescent; moderately alkaline; gradual wavy boundary.
- BC—74 to 80 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; weak medium subangular blocky structure; hard, firm; few very fine and fine roots; few very fine and fine moderate tubular pores; few cracks backfilled with very dark grayish brown (10YR 3/2) soil material from horizon above; few pressure surfaces; few intersecting slickensides; few fine rounded threads of calcium carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 80 inches
Thickness of mollic epipedon: 20 to 70 inches
Depth to bedrock: More than 80 inches
Depth to carbonates: More than 24 inches
Content of rock fragments: Less than 10 percent

A horizon:

Hue—10YR Value—2 to 4 Chroma—1 or 2 Texture—clay

Bss horizon:

Hue-10YR

Value—2 to 5
Chroma—1 or 2
Texture—silty clay or clay

Bkss horizon (where present):
Hue—10YR
Value—2 or 5
Chroma—1 or 2
Texture—silty clay or clay

BC horizon:
Hue—10YR
Value—5 or 6
Chroma—2 or 3

Texture—silty clay or clay

Campbellton Series

Depth class: Deep

Drainage class: Well drained Permeability: Moderately slow Landform: Stream terrace Parent material: Claystone Slope range: 1 to 5 percent

Associated soils: Esseville, Fashing, Laparita, and Schattel Taxonomic class: Fine, smectitic, hyperthermic Typic Argiustolls

Typical Pedon

Campbellton clay loam, 1 to 3 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, 15.8 miles north on U.S. Highway 281 to Interstate 37, 10.7 miles north on Interstate Highway 37, east 0.7 mile on Farm Road 99, north on county road 0.2 mile, northwest on field road 1,000 feet and 500 feet southwest in pasture; USGS Whitsett, Texas topographic quadrangle; lat. 28 degrees 40 minutes 9 seconds N. and long. 98 degrees 15 minutes 9 seconds W.

- A—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium prismatic and moderate medium subangular blocky structure; very hard, firm; common very fine and fine, few medium roots; common very fine and fine, and few medium tubular pores; few plate-like wormcasts; strongly effervescent; moderately alkaline; clear smooth boundary.
- Btk1—7 to 22 inches; grayish brown (10YR 5/2) clay, grayish brown (10YR 5/2) moist; moderate medium prismatic and moderate medium and coarse subangular blocky structure; extremely hard, very firm; common very fine and fine roots between peds; few very fine and fine tubular pores; common distinct clay films on faces of peds; few distinct nonintersecting slickensides; few wormcasts; few fine rounded concretions of calcium carbonate; violently effervescent; moderately alkaline; clear smooth boundary.
- Btk2—22 to 34 inches; pale brown (10YR 6/3) clay, pale brown (10YR 6/3) moist; moderate medium prismatic and moderate medium and coarse subangular blocky structure; extremely hard, very firm; common very fine and fine roots between peds; few very fine and fine tubular pores; common distinct clay films on faces of peds; common distinct pressure surfaces; few distinct nonintersecting slickensides; few wormcasts; few fine and medium soft masses of calcium carbonate; few fine rounded concretions of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

Btky—34 to 43 inches; light gray (10YR 7/2) clay, light brownish gray (10YR 6/2) moist; moderate medium prismatic and moderate fine and medium subangular blocky structure; extremely hard, very firm; few very fine and fine roots between peds; few very fine and fine tubular pores; 1 percent by volume fragments of olive (5Y 5/4) shale; few distinct pressure surfaces; common fine and medium soft masses of calcium carbonate; few fine rounded concretions of calcium carbonate; few fine plate-like gypsum crystals; strongly effervescent; moderately alkaline; gradual smooth boundary.

CBky—43 to 49 inches; pale olive (5Y 6/3) clay, pale olive (5Y 6/3) moist; weak medium prismatic and moderate fine and medium angular blocky structure; extremely hard, very firm; few very fine and fine roots between peds; few very fine and fine tubular pores; 15 percent by volume fragments of olive (5Y 5/4) shale; few distinct pressure surfaces; common fine and medium plate-like gypsum crystals; common fine and medium soft masses of calcium carbonate; few fine rounded concretions of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

Cd—49 to 80 inches; olive (5Y 5/4) soft claystone with texture of clay, olive (5Y 5/4) moist; massive; extremely hard, extremely firm; common fine and medium plate-like gypsum crystals; few fine and medium soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: 40 to 60 inches

Thickness of mollic epipedon: 7 to 15 inches

Depth to bedrock: Bedrock (densic) 40 to 60 inches

Depth to carbonates: Less than 24 inches Content of rock fragments: Less than 10 percent

A horizon:

Hue-10YR

Value—3 to 5

Chroma—1 to 3

Texture—clay loam

Bt or Btk horizon:

Hue-10YR or 2.5Y

Value—4 or 5

Chroma-2 to 4

Texture—clay loam or clay

Btky horizon:

Hue—10YR or 2.5Y

Value—5 to 7

Chroma-2 to 4

Texture— clay loam or clay

CBy and Cd horizons:

Hue—10YR to 5Y

Value—5 to 8

Chroma-2 to 4

Texture—loam or clay interbedded with soft claystone

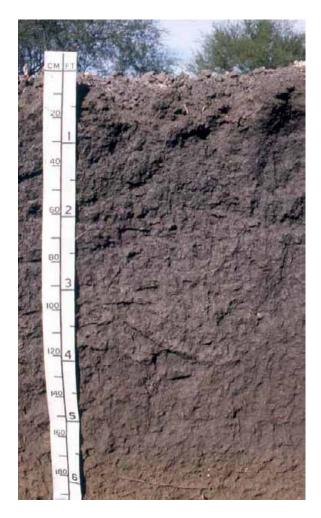


Figure 21.—Profile of Buchel clay, 0 to 1 percent slopes, occasionally flooded. Evidence of slickensides can be seen beginning at a depth of 8 inches.

Choke Series

Depth class: Very deep Drainage class: Well drained Permeability: Moderate Landform: Knob on interfluve

Parent material: Loamy tuffaceous sediments

Slope range: 1 to 5 percent

Associated soils: Eloso, Pavelek, Rosenbrock, Sancajo

Taxonomic class: Fine-silty, mixed, superactive, hyperthermic Aridic Calciustolls

Typical Pedon

Choke silty clay loam, 1 to 3 percent slopes (fig. 22); in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, 15.8 miles north on U.S. Highway 281, 3.9 miles north on Interstate Highway 37, 1.0 mile east on Farm Road 2049, 1.6 miles north on county road and 0.45 mile west in rangeland; USGS Comanche Hills, Texas topographic quadrangle; lat. 28 degrees 36 minutes 24 seconds N. and long. 98 degrees 11 minutes 24 seconds W.

- A1—0 to 4 inches; dark grayish brown (10YR 4/2) silty clay loam, very dark grayish brown (10YR 3/2) moist; moderate fine granular structure; slightly hard, friable; common very fine and fine, and few medium and coarse roots; few very fine and fine tubular pores; common termite casts; EC is 0.69 mmhos/cm; slightly effervescent; moderately alkaline; clear smooth boundary.
- A2—4 to 10 inches; very dark grayish brown (10YR 3/2) silty clay loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable; common very fine and fine, and few medium and coarse roots; common very fine and fine tubular pores; common termite casts; EC is 0.61 mmhos/cm; slightly effervescent; moderately alkaline; clear smooth boundary.
- Bw1—10 to 16 inches; dark grayish brown (10YR 4/2) silty clay loam; very dark grayish brown (10YR 3/2) moist; weak medium prismatic structure parting to moderate fine subangular blocky, slightly hard, friable; common very fine and fine, and few medium and coarse roots; common very fine and fine tubular pores; common termite casts; EC is 0.85 mmhos/cm; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bw2—16 to 24 inches; grayish brown (10YR 5/2) silty clay loam, dark grayish brown (10YR 4/2) moist; weak fine and medium prismatic structure parting to moderate fine subangular blocky; hard, friable; common very fine and fine, and few medium roots; common very fine and fine and few medium tubular pores; few threads of calcium carbonate; common termite casts; EC is 0.49 mmhos/cm; violently effervescent; moderately alkaline; gradual smooth boundary.
- Bk1—24 to 34 inches; light brownish gray (10YR 6/2) silty clay loam, grayish brown (10YR 5/2) moist; weak fine and medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable; common very fine and fine, and few medium and coarse roots; many very fine and fine, and common medium tubular pores; 5 percent films and threads of calcium carbonate; common termite casts; EC is 0.45 mmhos/cm; violently effervescent; gradual smooth boundary.
- Bk2—34 to 48 inches; light gray (10YR 7/2) silt loam, very pale brown (10YR 7/3) moist; weak fine and medium prismatic structure parting to moderate fine and medium subangular blocky; hard, friable; common very fine and fine, and few medium and coarse roots; many very fine and fine, and common medium tubular pores; 5 percent films and threads of calcium carbonate; few termite casts; EC is 1.27 mmhos/cm; violently effervescent; moderately alkaline; gradual smooth boundary.
- Bk3—48 to 58 inches; light gray (10YR 7/2) loam, very pale brown (10YR 7/3) moist; weak fine and medium prismatic structure parting to moderate fine and medium subangular blocky; slightly hard, very friable; few very fine and fine roots; common very fine and fine tubular pores; 3 percent films and threads of calcium carbonate; few termite casts; EC is 4.32 mmhos/cm; violently effervescent; moderately alkaline; clear smooth boundary.
- BCk—58 to 61 inches; light gray (10YR 7/2) loam, very pale brown (10YR 7/3) moist; weak fine subangular blocky structure; soft, very friable; few very fine and fine roots; common very fine and fine tubular pores; few rounded quartz pebbles mostly along lower boundary; 2 percent fine threads and concretions of calcium carbonate; EC is 6.03 mmhos/cm; strongly effervescent; moderately alkaline; abrupt wavy boundary.
- 2Cd—61 to 80 inches; very pale brown (10YR 7/3) noncemented tuffaceous siltstone, pale brown (10YR 6/3) moist; massive extremely hard, extremely firm; few very fine, fine, medium, and coarse roots along fractures; fractures are spaced 3 to 8 inches apart; common very fine and fine and fine tubular pores; few coatings of calcium carbonate along vertical and horizontal fractures; EC is 9.37 mmhos/cm; strongly effervescent; moderately alkaline.



Figure 22.—Profile of Choke silty clay loam, 1 to 3 percent slopes. The soil becomes much lighter in color beginning at about 18 inches. Carbonates begin to increase at this depth as well.

Range in Characteristics

Solum thickness: 60 to 80 inches

Thickness of mollic epipedon: 7 to 19 inches Depth to bedrock: More than 60 inches Depth to carbonates: Less than 40 inches Content of rock fragments: Less than 10 percent

A horizon:

Hue—10YR Value—3 to 5 Chroma—2 or 3 Texture—silty clay loam

Bw horizon:

Hue—10YR Value—4 to 6 Chroma-2 to 4

Texture—loam, silt loam, silty clay loam, or clay loam

Bk horizon:

Hue—10YR

Value—5 to 7

Chroma-2 to 4

Texture—loam, silt loam, silty clay loam, or clay loam

BCk horizon:

Hue-10YR or 2.5Y

Value—6 to 8

Chroma—2 to 4

Texture—silt loam, loam, or silty clay loam

2Cd horizon:

Hue-10YR to 5Y

Value—7 or 8

Chroma-2 to 4

Texture—noncemented siltstone that has a silt loam texture

Clareville Series

Depth class: Very deep Drainage class: Well drained Permeability: Moderately slow Landform: Stream terrace Parent material: Loamy alluvium Slope range: 0 to 3 percent

Associated soils: Weesatche, Pernitas, Cov.

Taxonomic class: Fine, smectitic, hyperthermic Pachic Argiustolls

Typical Pedon

Clareville sandy clay loam, 0 to 1 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, 5.6 miles east on U.S. Highway 59, 7.7 miles north on Interstate Highway 37, 3.2 miles east on Farm Road 1203, 1.6 miles northeast on county road and 1,000 feet northwest in pasture; USGS Oakville, Texas topographic quadrangle; lat. 28 degrees 27 minutes 45 seconds N. and long. 98 degrees 2 minutes 13 seconds W.

- A—0 to 12 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; very hard, very firm; many very fine and fine, and few medium roots; common very fine and fine pores; few wormcasts; noneffervescent; slightly alkaline; clear smooth boundary.
- Bt1—12 to 21 inches; very dark gray (10YR 3/1) sandy clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; extremely hard, very firm; common very fine and fine roots; few very fine pores; common clay films on ped faces; few insect casts; noneffervescent; slightly alkaline; clear smooth boundary.
- Bt2—21 to 28 inches; very dark grayish brown (10YR 3/2) sandy clay loam; very dark brown (10YR 2/2) moist; moderate fine and medium prismatic and moderate fine subangular blocky structure; very hard, very firm; common very fine and fine roots; few very fine pores; common clay films on ped faces; noneffervescent; slightly alkaline; clear wavy boundary.
- Btk1—28 to 35 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; very hard, very firm; few clay films; few very fine and fine roots; few very fine pores; common very

dark grayish brown (10YR 3/2) pressure surfaces; 3 percent by volume visible threads and films of calcium carbonate; 1 percent by volume fine nodules of calcium carbonate; slightly effervescent; moderately alkaline; clear smooth boundary.

- Btk2—35 to 45 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; very hard, very firm; few very fine roots; few very fine pores; few clay films; 5 percent by volume visible threads and films of calcium carbonate; 3 percent by volume fine nodules of calcium carbonate; slightly effervescent; moderately alkaline; clear wavy boundary.
- Bk—45 to 59 inches; brown (10YR 5/3) sandy clay loam, brown (10YR 4/3) moist; weak fine and medium subangular blocky structure; hard, friable; few very fine roots; few fine pores; few fine and medium faint yellowish brown (10YR 5/6) redox concentrations; 5 percent by volume films and threads of calcium carbonate; 3 percent by volume fine nodules of calcium carbonate; slightly effervescent; moderately alkaline; clear wavy boundary.
- BCk—59 to 80 inches; brownish yellow (10YR 6/6) sandy clay loam, yellowish brown (10YR 5/6) moist; weak fine subangular blocky structure; slightly hard, friable; few very fine pores; common fine and medium distinct yellowish brown (10YR 5/4) redox concentrations; 7 percent by volume films and threads of calcium carbonate; 3 percent by volume fine nodules of calcium carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: 60 to 80 inches

Thickness of mollic epipedon: 20 to 40 inches Depth to bedrock: More than 80 inches Depth to carbonates: 24 to 36 inches

Content of rock fragments: Less than 10 percent

A horizon:

Hue—10YR Value—2 to 4 Chroma—1 to 3

Texture—sandy clay loam

Bt horizon:

Hue-7.5YR or 10YR

Value—2 to 4 Chroma—1 or 2

Texture—sandy clay loam, clay loam, sandy clay, or clay

Btk and Bk horizon:

Hue-7.5YR or 10YR

Value—3 to 6

Chroma—1 to 4

Texture—clay loam, sandy clay, or clay

BCk horizon:

Hue-7.5YR or 10YR

Value—5 to 8

Chroma-2 to 6

Texture—loam, sandy clay loam, or clay loam

Condido Series

Depth class: Shallow

Drainage class: Well drained Permeability: Very slow Landform: Low ridge

Parent material: Clayey alluvium over noncemented siltstone

Slope range: 0 to 2 percent

Associated soils: Eloso, Pavelek, Rosenbrock

Taxonomic class: Clayey, smectitic, hyperthermic shallow Petrocalcic Paleustolls

Typical Pedon

Condido clay, 0 to 2 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles on U.S. Highway 281, north 3.9 miles on Interstate Highway 37, east 1.0 mile on Farm Road 2049, north 1.1 miles on county road, east 0.6 mile on county road; site is 100 feet north in field; USGS Comanche Hills, Texas topographic quadrangle; lat. 28 degrees 35 minutes 58 seconds N. and long. 98 degrees 10 minutes 3 seconds W.

- Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; very hard, very firm, very sticky and very plastic; many very fine, common fine, and few medium roots; few fine tubular pores; few faint pressure surfaces; noneffervescent; neutral; clear smooth boundary.
- A1—6 to 13 inches; black (10YR 2/1) clay, black (10YR 2/1) moist; moderate fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; many very fine, common fine, and few medium roots; few fine tubular pores; common distinct pressure surfaces; noneffervescent; slightly alkaline; clear smooth boundary.
- A2—13 to 16 inches; black (10YR 2/1) gravelly clay, black (10YR 2/1) moist; moderate fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; common very fine, fine, and few medium roots; few fine tubular pores; contains 24 percent by volume fragments of degraded petrocalcic less than 1 inch across; common distinct pressure surfaces; noneffervescent; moderately alkaline; abrupt wavy boundary.
- Bkm—16 to 28 inches; white (10YR 8/1), strongly cemented caliche; white (10YR 8/1) moist; massive; laminar cap is 1/2 inch thick; many very fine and fine roots matted at top of horizon; violently effervescent; moderately alkaline; gradual wavy boundary.
- 2Cd—28 to 80 inches; very pale brown (10YR 7/3), noncemented siltstone of silt loam texture; pale brown (10YR 6/3) moist; massive; common threads and soft masses of calcium carbonate coats along vertical and horizontal fracture seams; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: Less than 20 inches Thickness of mollic epipedon: 7 to 20 inches Depth to cemented layer. Less than 20 inches Content or rock fragments: Less than 25 percent

Ap, A1, and A2 horizons: Hue—10YR Value—2 to 4 Chroma—1 or 2

Texture—clay

A3 horizons (where present):

Hue—10YR

Value—2 to 5

Chroma—1 or 2

Texture—silty clay or clay

Bkm horizon:

Hue-7.5YR to 2.5Y

Value—6 to 8

Chroma—1 to 4

Texture—strongly cemented caliche

2Cd horizon:

Hue—7.5YR to 2.5Y

Value—6 to 8

Chroma—2 to 4

Texture—noncemented siltstone with texture of loam or silt loam

Conquista Series

Depth class: Very deep Drainage class: Well drained Permeability: Very slow

Landform: Summits and side slopes

Parent material: Mine spoil Slope range: 1 to 40 percent

Associated soils: Eloso, Pavelek, Monteola

Taxonomic class: Fine-loamy, mixed, superactive, hyperthermic Entic Haplustolls

Typical Pedon

Conquista clay, 1 to 3 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles on U.S. Highway 281, north 3.9 miles on Interstate Highway 37, east 1.0 mile on Farm Road 2049, north 3.0 miles on county road and 1,000 feet east in pasture; USGS Peggy, Texas topographic quadrangle; lat. 28 degrees 37 minutes 39 seconds N. and long. 98 degrees 10 minutes 47 seconds W.

- Ap—0 to 13 inches; very dark gray (10YR 3/1) clay, very dark gray (10YR 3/1) moist; moderate fine and medium subangular blocky structure; extremely hard, firm, very sticky and very plastic; many very fine, fine, and common medium roots; common fine pores; few snail shell fragments; few insect casts; common light gray (10YR 5/1) spots; few fine very pale yellow (10YR 8/2) fragments of siltstone ½ inch to 3 inches across; strongly effervescent; moderately alkaline; abrupt smooth boundary.
- 2C1—13 to 28 inches; pale olive (5Y 6/3) gravelly loam, pale olive (5Y 6/3) moist; massive; very hard, firm, slightly sticky and moderately plastic; few very fine and fine roots; contains 20 percent hard fragments of siltstone ¼ inch to 3 inches across; few chert fragments; few fine and medium soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual wavy boundary.
- 2C2—28 to 80 inches; pale olive (5Y 6/3) gravelly loam, pale olive (5Y 6/3) moist; massive; very hard, firm, slightly sticky and moderately plastic; few very fine and fine roots; 30 percent by volume hard fragments of siltstone ¼ inch to 3 inches across; few chert fragments; few fine and medium soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Rooting depth: More than 60 inches

Thickness of mollic epipedon: 7 to 17 inches Depth to tuffaceous siltstone: 20 to 40 inches Content of rock fragments: Less than 35 percent

A horizon:

Hue—10YR Value—2 to 4 Chroma—1 or 2 Texture—clay

2C horizon:

Hue—5YR to 5Y Value—6 to 8 Chroma—2 to 4

Texture—very fine sandy loam, loam, sandy clay loam, or their gravelly counterparts

Cotulla Series

Depth class: Very deep Drainage class: Well drained Permeability: Very slow Landform: Interfluve

Parent material: Calcareous, saline, clayey sediments

Slope range: 1 to 3 percent

Associated soils: Danjer, Pernitas, Monteola

Taxonomic class: Fine, smectitic, hyperthermic, Sodic Haplusterts

Typical Pedon

Cotulla clay loam, 1 to 3 percent slopes (fig. 23); in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 2.4 miles on U.S. Highway 281, west 7.8 miles on Farm Road 889 and 1,000 feet southwest in pasture; USGS Oakville SW, Texas topographic quadrangle; lat. 28 degrees 16 minutes 44 seconds N. and long. 98 degrees 13 minutes 35 seconds W.

- Ap—0 to 7 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky structure; hard, very firm; common very fine and fine roots; common fine tubular pores; vertical cracks 1/2 inch wide, 3 feet apart, and 6 feet deep; few fine and medium cylindrical insects casts; slightly effervescent; moderately alkaline; abrupt wavy boundary.
- Bw—7 to 12 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium angular blocky structure; extremely hard, very firm; common very fine and fine roots; common fine tubular pores; few pressure surfaces; few fine and medium cylindrical insects casts; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bk—12 to 18 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate coarse prismatic and strong medium angular blocky structure; extremely hard, very firm; common fine and few medium roots; few fine tubular pores; few pressure surfaces; cracks ¼ inch wide backfilled with surface material; 2 percent concretions of calcium carbonate; 3 percent soft masses of calcium carbonate; nonsaline; SAR is 7; strongly effervescent; strongly alkaline; clear smooth boundary.

Bknss—18 to 26 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate coarse prismatic and strong medium angular blocky

structure; extremely hard, very firm; few fine roots; few fine tubular pores; many pressure surfaces; common nonintersecting slickensides; common wedged-shaped aggregates; 1 percent ¼ inch wide cracks; 6 percent fine and medium soft masses of calcium carbonate; nonsaline; SAR is 14; strongly effervescent; strongly alkaline; gradual smooth boundary.

- Bkn—26 to 34 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate coarse prismatic and moderate medium angular blocky and moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; few fine tubular pores; few pressure surfaces; few wedged-shaped aggregates; 3 percent soft masses of calcium carbonate; very slightly saline; SAR is 22; strongly effervescent; moderately alkaline; gradual smooth boundary.
- Bn—34 to 52 inches; brown (10YR 5/3) clay, brown (10YR 5/3) moist; moderate medium subangular blocky structure; extremely hard, very firm; few fine roots; few fine tubular pores; few wedged-shaped aggregates in upper part of horizon; 1 percent termite casts; 1 percent soft masses of calcium carbonate; less than 1 percent fine quartz pebbles; slightly saline; SAR is 21; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bny—52 to 74 inches; pale brown (10YR 6/3) clay, brown (10YR 5/3) moist; moderate coarse prismatic and moderate medium subangular blocky and moderate fine angular blocky structure; extremely hard, very firm; few fine roots; few fine tubular pores; few shiny pressure surfaces; few grooved shiny nonintersecting

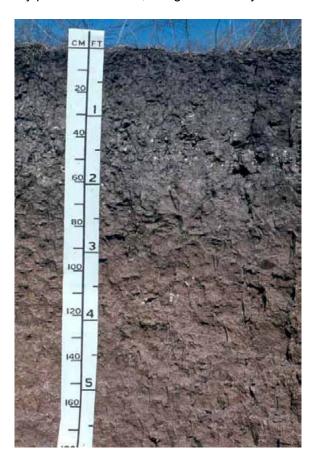


Figure 23.—Profile of Cotulla clay loam, 1 to 3 percent slopes. There is an accumulation of exchangeable sodium in the soil.

slickensides in lower part; 10 percent crystals and soft masses of gypsum; moderately saline; SAR is 19; strongly effervescent; moderately alkaline; gradual smooth boundary.

Bnssy—74 to 80 inches; brown (7.5YR 5/4) clay, brown (7.5YR 5/4) moist; weak coarse prismatic and weak medium subangular blocky structure; very hard, very firm; few fine roots; few fine tubular pores; few pressure surfaces; many nonintersecting slickensides; few fine stains of iron-manganese on ped faces; 2 percent crystals and soft masses of gypsum; slightly saline; SAR is 24; strongly effervescent; neutral.

Range in Characteristics

Solum thickness: More than 60 inches Depth to bedrock: More than 80 inches Depth to sodic horizon: Less than 30 inches Content of rock fragments: Less than 15 percent

A horizon:

Hue—10YR or 2.5Y Value—4 to 6 Chroma—2 to 4 Texture—clay loam

Bw and Bk horizon:

Hue—10YR or 2.5Y Value—4 to 6 Chroma—2 to 4 Texture—clay loam or clay

Bkss and Bnssy horizon:

Hue—7.5YR or 10YR Value—5 to 7 Chroma—2 to 4 Texture—clay loam or clay

Coy Series

Depth class: Very deep Drainage class: Well drained Permeability: Very slow Landform: Draw on interfluve

Parent material: Calcareous clayey alluvium

Slope range: 0 to 3 percent

Associated soils: Clareville, Monteola, Cotulla

Taxonomic class: Fine, smectitic, hyperthermic Vertic Argiustolls

Typical Pedon

Coy clay loam, 0 to 1 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, east 2.6 miles on U.S. Highway 59, and 200 feet south in cropland; USGS George West, Texas topographic quadrangle; lat. 28 degrees 19 minutes 39 seconds and long. 98 degrees 4 minutes 0 seconds.

Ap—0 to 6 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; very hard, very firm; common fine and few medium roots; few very fine pores; few snail shell fragments; strongly effervescent; moderately alkaline; clear smooth boundary.

A—6 to 11 inches; very dark gray (10YR 3/1) clay loam, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; very hard, very firm; common fine and few medium roots; few very fine and fine pores; few snail shell fragments; strongly effervescent; moderately alkaline; clear wavy boundary.

- Bt1—11 to 25 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, very firm; common fine and few medium roots; few very fine and fine pores; common clay films on ped faces; few shiny pressure surfaces; strongly effervescent; moderately alkaline; clear wavy boundary.
- Bt2—25 to 38 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; extremely hard, very firm; few fine roots; few very fine and fine pores; common clay films on ped faces; common fine pressure surfaces; violently effervescent; moderately alkaline; clear wavy boundary.
- Bt3—38 to 50 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic and moderate fine and medium angular blocky structure; extremely hard, very firm; few fine pores; few fine roots; few faint clay films on ped faces; few fine pressure surfaces; 2 percent by volume soft masses and threads of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.
- Bk1—50 to 62 inches; brown (10YR 5/3) clay, dark brown (10YR 4/3) moist; moderate fine and medium subangular blocky structure; extremely hard, very firm; few fine roots; few very fine and fine pores; few fine shiny pressure surfaces; 3 percent by volume soft masses and threads of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.
- Bk2—62 to 80 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; very hard, very firm; few fine roots; few very fine and fine pores; 2 percent by volume soft masses and threads of calcium carbonate; violently effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 80 inches

Thickness of mollic epipedon: 20 to 50 inches Depth to bedrock: More than 80 inches

Content of rock fragments: Less than 10 percent

A horizon:

Hue—10YR Value—2 to 4 Chroma—1 or 2 Texture—clay loam

Bt horizon:

Hue—10YR Value—2 to 4 Chroma—1 to 4

Texture—clay loam, sandy clay, or clay

Bk horizon:

Hue—10YR
Value—5 to 7
Chroma—2 to 6
Texture—clay loam, sandy clay, or clay

Danjer Series

Depth class: Very deep Drainage class: Well drained Permeability: Very slow Landform: Draw on interfluve

Parent material: Calcareous, clavey alluvium

Slope range: 0 to 3 percent

Associated soils: Pernitas, Monteola, Cotulla

Taxonomic class: Fine, smectitic, hyperthermic, Typic Haplusterts

Typical Pedon

Danjer clay, 1 to 3 percent slopes (fig. 24); in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, south 21.0 miles on U.S. Highway 281, west 12.5 miles on Farm Road 624 to ranch gate, south 2.0 miles on ranch road and 0.5 mile east along pipeline in rangeland; USGS Clegg, Texas topographic quadrangle; lat. 28 degrees 4 minutes 30 seconds N. and long. 98 degrees 15 minutes 45 seconds W.

- A1—0 to 6 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium subangular blocky structure; very hard, very firm; many fine, medium, and common coarse roots; few very fine and fine tubular pores; few snail shell fragments; strongly effervescent; moderately alkaline; abrupt smooth boundary.
- A2—6 to 15 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic and strong medium subangular blocky structure; very hard, very firm; common fine, medium and few coarse roots; few very fine and fine tubular pores; few fine pressure surfaces; few cracks less than ½ inch and 1 foot apart; few fine snail shell fragments; few fine quartz pebbles; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bss1—15 to 27 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate coarse prismatic and moderate medium angular blocky structure; very hard, very firm; common fine and medium roots; few very fine and fine tubular pores; many pressure surfaces tilted 10 to 20 degrees; cracks less than ½ inch wide; few snail shell fragments; few fine quartz pebbles; few strongly effervescent; strongly alkaline; gradual smooth boundary.
- Bss2—27 to 45 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate coarse prismatic and moderate medium angular blocky structure; very hard, very firm; few fine and medium roots; few very fine and fine tubular pores; common pressure surfaces; common pressure surfaces tilted 10 to 20 degrees; 15 percent spots and streaks of brown (7.5YR 4/4) soil material vertically oriented; 2 percent fine and medium concretions of calcium carbonate; less than 1 percent soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.
- Bw1—45 to 59 inches; light brown (7.5YR 6/4) clay, brown (7.5YR 5/4) moist; moderate fine subangular blocky structure; very hard, very firm; few fine and medium roots; few very fine and fine tubular pores; few fine pressure surfaces; few fine snail shell fragments; 2 percent fine concretions of calcium carbonate; strongly effervescent; moderately alkaline; diffuse smooth boundary.
- Bw2—59 to 71 inches; brown (7.5YR 5/4) clay, brown (7.5YR 5/4) moist; moderate medium subangular blocky structure; very hard, very firm; few fine, medium and coarse roots; few very fine and fine tubular pores; few fine pressure surfaces; few spots of organic coatings in pores; strongly effervescent; moderately alkaline; clear smooth boundary.

Bw3—71 to 80 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 5/4) moist; weak medium subangular blocky structure; hard, firm; few fine roots; few fine tubular pores; few fine spots of organic coatings; few distinct organic coats on vertical and horizontal faces of peds; 1 percent soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 80 inches Thickness of mollic epipedon: 15 to 50 inches Depth to bedrock: More than 80 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—10YR or 2.5Y Value—3 or 4 Chroma—1 or 2

Texture—clay loam or clay

Bss horizon:

Hue—7.5YR or 10YR Value—3 or 4 Chroma—1 to 3

Texture—clay loam or clay



Figure 24.—Profile of Danjer clay, 1 to 3 percent slopes. This soil has a high shrink-swell potential due to its clayey texture.

Bw and Bk horizons:

Hue—5YR to 10YR

Value—5 to 8

Chroma—2 to 4

Texture—clay loam or clay

Ecleto Series

Depth class: Very shallow and shallow

Drainage class: Well drained

Permeability: Slow Landform: Ridge

Parent material: Loamy residuum over weakly cemented sandstone

Slope range: 1 to 3 percent

Associated soils: Fashing, Picosa, Laparita

Taxonomic class: Clayey, smectitic, hyperthermic, shallow Typic Argiustolls

Typical Pedon

Ecleto sandy clay loam, 1 to 3 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles on U.S. Highway 281, north 10.7 miles on Interstate 37, west 8.5 miles on Farm Road 99, east on private ranch road 1.0 mile and 500 feet north in rangeland; USGS Willow Hollow Tank, Texas topographic quadrangle; lat. 28 degrees 34 minutes 24 seconds N. and long. 98 degrees 19 minutes 46 seconds. W.

- A—0 to 5 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; weak fine subangular blocky structure; hard, firm; many fine and common medium roots; common very fine and fine pores; noneffervescent; slightly acid; abrupt smooth boundary.
- Bt1—5 to 13 inches; brown (10YR 4/3) clay, dark brown (10YR 3/3) moist; moderate fine and medium subangular blocky structure; very hard, very firm; common fine and few medium roots; few very fine and fine pores; common clay films on ped faces; noneffervescent; neutral; clear smooth boundary.
- Bt2—13 to 18 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium angular blocky structure; extremely hard, very firm; common very fine and fine pores; common fine and few medium roots; common apparent clay films along ped faces; noneffervescent; neutral; abrupt smooth boundary.
- Cr1—18 to 24 inches; light brownish gray (10YR 6/2), weakly cemented sandstone; grayish brown (10YR 5/2) moist; brittle; few fine roots; few spots of Bt material in fractures of sandstone; slightly effervescent; slightly alkaline; clear smooth boundary.
- Cr2—24 to 80 inches; light gray (10YR 7/2), weakly cemented coarsely fractured sandstone; light brownish gray (10YR 6/2) moist; brittle; slightly effervescent; slightly alkaline.

Range in Characteristics

Solum thickness: 10 to 20 inches Depth to bedrock: 10 to 20 inches

Content of rock fragments: Less than 10 percent

A horizon: Hue—10YR Value—2 to 4

Chroma—1 or 2

Texture—sandy clay loam

Bt horizon:

Hue—10YR Value—2 to 6 Chroma—1 to 3

Texture—clay loam, sandy clay, or clay

Cr horizon:

Hue—10YR Value—6 to 8 Chroma—1 to 3

Texture—weakly cemented sandstone

Eloso Series

Depth class: Moderately deep Drainage class: Well drained Permeability: Very slow Landform: Interfluve

Parent material: Clayey alluvium over weakly cemented siltstone

Slope range: 0 to 3 percent

Associated soils: Pavelek, Rosenbrock, Choke, Sancajo

Taxonomic class: Fine, smectitic, hyperthermic Vertic Haplustolls

Typical Pedon

Eloso clay, 1 to 3 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 10.0 miles on U.S. Highway 281, northeast 4.0 miles on Texas Highway 72, north 1.8 miles on county road and 200 feet east in field; USGS Ray Point, Texas topographic quadrangle; lat. 28 degrees 32 minutes 36 seconds N. and long. 98 degrees 6 minutes 28 seconds W.

- Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; very hard, firm; few very fine and fine roots; few snail shell fragments; slightly effervescent; slightly alkaline; clear smooth boundary.
- A—6 to 18 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium angular blocky and subangular blocky structure; very hard, firm; few very fine roots; few fine pores; common pressure surfaces; few snail shell fragments; slightly effervescent; slightly alkaline; clear smooth boundary.
- Bk—18 to 30 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; moderate medium prismatic and moderate medium angular blocky and subangular blocky structure; very hard, firm; few very fine roots; few fine pores; common soft masses of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.
- 2Cd—30 to 80 inches; pink (7.5YR 7/4), noncalcareous noncemented siltstone with texture of silt loam; light brown (7.5YR 6/4) moist; massive; contains common light brownish gray (10YR 6/2) soil in cracks; common soft masses of calcium carbonate in fractures; common fine concretions of calcium carbonate; noneffervescent; slightly alkaline.

Range in Characteristics

Solum thickness: 20 to 40 inches

Thickness of mollic epipedon: 10 to 28 inches Depth to tuffaceous siltstone: 20 to 40 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—10YR

Value—2 or 3

Chroma—1 or 2

Texture—clay

Bk or Bw horizon:

Hue—10YR

Value—2 to 7

Chroma—1 or 2

Texture—silty clay or clay

2Cd horizon:

Hue—7.5YR to 2.5Y

Value—6 to 8

Chroma-1 to 4

Texture—noncalcareous noncemented siltstone with texture of loam or silt loam

Esseville Series

Depth class: Moderately deep to claystone

Drainage class: Well drained Permeability: Very slow Landform: Interfluve

Parent material: Saline clavev marine sediments

Slope range: 0 to 5 percent

Associated soils: Laparita, Fashing, Campbellton

Taxonomic class: Fine, smectitic, hyperthermic, Sodic Gypsiusterts

Typical Pedon

Esseville clay, 1 to 3 percent slopes (fig. 25); in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles on U.S. Highway 281, north 10.7 miles on Interstate Highway 37, east and north 6.0 miles on Farm Road 99 and 100 feet west in pasture; USGS Peggy, Texas topographic quadrangle; lat. 28 degrees 42 minutes 32 seconds N. and long. 98 degrees 11 minutes 45 seconds W.

- A—0 to 5 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium angular blocky structure; extremely hard, extremely firm; many fine and medium roots; few very fine and fine tubular pores; common pressure surfaces; common fine snail shell fragments; few fine quartz pebbles; SAR is 2; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bss—5 to 15 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium and coarse angular blocky structure; extremely hard, extremely firm; common fine and medium roots; few very fine and fine tubular pores; common prominent slickensides; common snail shell fragments; few fine quartz pebbles; SAR is 8; strongly effervescent; slightly alkaline; clear wavy boundary.
- Bkssyz1—15 to 18 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, extremely firm; common fine and medium roots; few very fine and fine tubular pores; common prominent slickensides; common soft masses of calcium carbonate; few filaments of gypsum; slightly saline; 3 percent by volume fine and medium filaments of salt; few fine snail shell fragments; SAR is 11; strongly effervescent; slightly alkaline; clear wavy boundary.

Bkssyz2—18 to 32 inches; dark gray (10YR 4/1) and pale brown (10YR 6/3) clay, very dark gray (10YR 3/1) and brown (10YR 5/3) moist; moderate fine and medium angular blocky structure; extremely hard, extremely firm; common fine, medium, and few coarse roots; few very fine and fine tubular pores; many prominent slickensides; common soft masses of calcium carbonate; common filaments and masses of gypsum; 6 percent by volume filaments of salt; few snail shell fragments; 1 percent by volume spots of light brownish gray (2.5Y 6/2) soil material from below; few medium quartz pebbles; slightly saline; SAR is 18; strongly effervescent; slightly alkaline; clear wavy boundary.

BCssyz—32 to 36 inches; light gray (2.5Y 7/2) clay, light brownish gray (2.5Y 6/2) moist; moderate fine and medium angular blocky structure; very hard, very firm; few fine and medium roots; few very fine and fine tubular pores; 15 percent very dark gray (10YR 3/1) soil material infilling vertical cracks; few prominent slickensides; few masses of oxidized iron; common masses of gypsum; 6 percent by volume concentrations of salt; moderately saline; SAR is 21; strongly effervescent; slightly alkaline; clear wavy boundary.

Cd1—36 to 53 inches; light gray (5Y 7/2) soft noncemented claystone, light olive gray (5Y 6/2) moist; massive; very hard, very firm; few fine and medium roots; 10 percent light brown (7.5YR 6/4) and very dark gray (10YR 3/1) effervescent soil material infilling vertical cracks; 1 percent by volume masses of oxidized iron; 4 percent by volume has masses of gypsum; 4 percent by volume has masses of salts; moderately saline; SAR is 20; noneffervescent; slightly alkaline; clear wavy boundary.



Figure 25.—Profile of Esseville clay, 1 to 3 percent slopes. Cracks are noticeable in the surface layer. Slickensides are shown at depths of 18 and 36 inches.

Cd2—53 to 60 inches; pale yellow (5Y 8/2) soft noncemented claystone, light gray (5Y 7/2) moist; massive; very hard, very firm; few fine and medium roots; 4 percent dark gray (10YR 4/1) soil material infilling vertical cracks; few pressure surfaces; few masses of iron accumulation; 3 percent crystals of gypsum; 2 percent filaments of salt; moderately saline; SAR is 20; slightly alkaline; clear wavy boundary.

Cd3—60 to 80 inches; pale yellow (5Y 7/3) soft noncemented claystone, pale olive (5Y 6/3) moist; few fine distinct light brownish gray (10YR 6/2) mottles; massive; very hard, very firm; few fine and medium roots; 3 percent medium and coarse strong brown (7.5YR 5/8) and yellowish brown (10YR 5/8) masses of iron accumulation; 3 percent crystals of gypsum; 3 percent filaments of salts; moderately saline; SAR is 21; slightly alkaline.

Range in Characteristics

Solum thickness: 20 to 40 inches over noncemented claystone

Thickness of mollic epipedon: 11 to 32 inches Depth to bedrock: More than 60 inches Depth to gypsic horizon: 12 to 35 inches

A horizon:

Hue—10YR Value—2 to 4 Chroma—1 to 3

Texture—clay or gravelly clay

Bss and Bkssyz horizon:

Hue—10YR Value—3 or 4

Chroma-2 to 4

Texture—sandy clay, silty clay, or clay

BCssyz horizon:

Hue—10YR or 2.5Y Value—4 to 7

Chroma—2 to 4

Texture—sandy clay, silty clay, or clay

Cd horizon:

Hue-10YR to 5Y

Value—4 to 8

Chroma-2 to 4

Texture—noncemented claystone with texture of clay

Fashing Series

Depth class: Shallow over weakly cemented sandstone and soft claystone

Drainage class: Well drained

Permeability: Slow Landform: Ridge

Parent material: Clayey alluvium over weakly cemented sandstone

Slope range: 2 to 5 percent

Associated soils: Esseville, Campbellton

Taxonomic class: Clayey, smectitic, hyperthermic, shallow Entic Haplustolls

Typical Pedon

Fashing clay loam, 2 to 5 percent slopes; in Live Oak County, Texas; from the Intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles on U.S. Highway 281, north 10.7 miles on Interstate 37, east 3.7 miles on Farm Road 99, northwest 0.4 mile on county road and 400 feet west in pasture; USGS Peggy, Texas topographic quadrangle; lat. 28 degrees 41 minutes 15 seconds N. and long. 98 degrees 12 minutes 54 seconds W.

- A1—0 to 4 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky and granular structure; hard, firm; common very fine and fine roots; few fine pores; few quartz pebbles less than 1/2 inch across; strongly effervescent; moderately alkaline; clear smooth boundary.
- A2—4 to 13 inches; dark grayish brown (10YR 4/2) clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium subangular blocky and moderate fine granular structure; hard, firm; common very fine roots; few fine and medium pores; few wormcasts; strongly effervescent; moderately alkaline; abrupt smooth boundary.
- 2Cd1—13 to 25 inches; light gray (10YR 7/1) noncemented claystone with texture of clay; gray (10YR 6/1) moist; hard, brittle; few very fine roots; 10 percent vertical cracks filled with dark grayish brown (10YR 5/2) soil material; common fine threads of calcium carbonate; moderately alkaline; violently effervescent; clear wavy boundary.
- 2Cd2—25 to 38 inches; light gray (2.5Y 7/2) noncemented sandstone, light brownish gray (2.5Y 6/2) moist; massive; hard, brittle; common fine threads and medium soft masses of calcium carbonate; moderately alkaline; violently effervescent; clear smooth boundary.
- 2Cd3—38 to 50 inches; pale yellow (2.5Y 7/3) noncemented claystone with texture of clay, light yellowish brown (2.5Y 6/3) moist; fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, brittle; few medium gypsum crystals; very slightly saline; strongly effervescent; moderately alkaline; clear smooth boundary.
- 2Cd4—50 to 80 inches; pale yellow (2.5Y 7/3) noncemented sandstone, light yellowish brown (2.5Y 6/3) moist; fine prominent yellowish brown (10YR 5/6) mottles; massive; hard, brittle; few fine and medium gypsum crystals; very slightly saline; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: 10 to 20 inches over noncemented claystone or sandstone

Thickness of mollic epipedon: 10 to 20 inches

Depth to sandstone and noncemented claystone: Less than 20 inches

A horizon:

Hue—10YR

Value—3 to 5

Chroma—1 or 2 Texture—clay loam

BC horizon (where present):

Hue—10YR

Value—3 to 7

Chroma—1 or 2

Texture—clay loam or clay

2Cd horizon:

Hue-10YR or 2.5Y

Value—7 or 8

Chroma—1 to 3

Texture—noncemented claystone with texture of clay, noncemented sandstone, or noncemented siltstone

Goliad Series

Depth class: Moderately deep to petrocalcic Drainage class: Moderately well drained

Permeability: Moderately slow

Landform: Interfluve

Parent material: Calcareous loamy alluvium

Slope range: 1 to 3 percent

Associated soils: Clareville, Lacoste, Olmos, Parrita, Weesatche

Taxonomic class: Fine, mixed, active, hyperthermic, Petrocalcic Paleustolls

Typical Pedon

Goliad fine sandy loam, 1 to 3 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south 15.6 miles on U.S. Highway 281, east 5.3 miles on Farm Road 3162, southeast 0.4 mile on private ranch road and 100 feet north along power line in rangeland; USGS Midway, Texas topographic quadrangle; lat. 28 degrees 6 minutes 25 seconds N. and long. 98 degrees 1 minute 49 seconds W.

- A—0 to 10 inches; brown (10YR 4/3) fine sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable; common fine and few medium roots; few fine pores; noneffervescent; neutral; clear smooth boundary.
- Bt1—10 to 15 inches; brown (7.5YR 4/4) sandy clay loam, dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure; hard, firm; common fine and few medium roots; few fine pores; common clay films on ped faces; noneffervescent; slightly alkaline; clear smooth boundary.
- Bt2—15 to 36 inches; reddish brown (5YR 4/4) sandy clay, dark reddish brown (5YR 3/4) moist; very strong fine and medium angular blocky structure; extremely hard, extremely firm; common fine roots; few fine pores; common distinct clay films on ped faces; few medium distinct very dark gray (10YR 3/1) organic stains; noneffervescent; slightly alkaline; abrupt wavy boundary.
- Bkm1—36 to 42 inches; very pale yellow (10YR 8/2) indurated caliche, light gray (10YR 7/2) moist; that is fractured in the upper 2 inches at 1 foot intervals; fractures are filled with reddish brown (5YR 4/4) sandy clay; caliche fractures into rounded nodules and concretions; violently effervescent; moderately alkaline; abrupt smooth boundary.
- Bkm2—42 to 80 inches; light gray (10YR 7/2) moderately cemented caliche that becomes more weakly cemented with depth; contains few rounded fine chert and quartz gravels; violently effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: 20 to 40 inches

Thickness of mollic epipedon: 7 to 12 inches Depth to bedrock: Less than 40 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—7.5YR or 10YR Value—3 to 5 Chroma—1 to 4 Texture—fine sandy loam

Bt1 horizon:

Hue—5YR or 7.5YR

Value—3 to 5

Chroma—2 to 4

Texture—sandy clay loam, clay loam, or sandy clay

Bt2 horizon:

Hue—2.5YR or 5YR

Value—4 to 6

Chroma—3 to 6

Texture—clay loam, sandy clay, or clay

Bkm horizon:

Hue-7.5YR or 10YR

Value—7 or 8

Chroma—1 to 3

Texture—moderately cemented to indurated caliche

Hindes Series

Depth class: Very deep Drainage class: Well drained Permeability: Moderately slow

Landform: Ridge

Parent material: Gravelly, loamy alluvium

Slope range: 3 to 8 percent

Associated soils: Mata, Olmos, Schattel

Taxonomic class: Clayey-skeletal, mixed, active, hyperthermic, Aridic Argiustolls

Typical Pedon

Hindes very gravelly sandy clay loam, 3 to 8 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles north on U.S. Highway 281, north 10.7 miles on Interstate 37, west 8.5 miles on Farm Road 99, east and south 3.2 miles on private ranch road and 50 feet west in rangeland; USGS Willow Hollow Tank, Texas topographic quadrangle; lat. 28 degrees 32 minutes 11 seconds N. and long. 98 degrees 18 minutes 38 seconds W.

- A—0 to 10 inches; dark brown (7.5YR 3/2) very gravelly sandy clay loam, very dark brown (7.5YR 2.5/2) moist; weak fine and medium subangular blocky structure; hard, friable; many very fine and fine roots; 40 percent by volume rounded pebbles of chert ½ inch to 3 inches across; 5 percent by volume fragments of chert 3 to 5 inches across; noneffervescent; slightly acid; clear smooth boundary.
- Bt1—10 to 15 inches; dark reddish brown (5YR 3/3) extremely gravelly clay, dark reddish brown (5YR 3/3) moist; moderate fine and medium subangular blocky structure; very hard, firm; common very fine roots; common distinct clay films on ped faces; 65 percent by volume rounded chert pebbles ½ inch to 2 inches across; noneffervescent; slightly acid; clear smooth boundary.
- Bt2—15 to 19 inches; dark reddish brown (2.5YR 3/4) extremely gravelly clay, dark reddish brown (2.5YR 2.5/4) moist; moderate fine and medium subangular blocky structure; very hard, firm; common very fine roots; common distinct clay films on ped faces; 70 percent by volume rounded chert pebbles mainly ¼ inch to 2 inches across; noneffervescent; slightly acid; abrupt smooth boundary.
- Btk1—19 to 22 inches; reddish brown (5YR 4/4) very gravelly clay, dark reddish brown (5YR 3/4) moist; weak fine and medium subangular blocky structure; very hard, firm; common fine roots; few distinct clay films on ped faces; 50 percent by volume rounded chert pebbles ½ inch to 2 inches across; common threads and

soft masses of calcium carbonate; few fine and medium nodules of calcium carbonate; strongly effervescent; slightly alkaline; clear smooth boundary.

Btk2—22 to 27 inches; brown (7.5YR 4/4) gravelly clay loam, dark brown (7.5YR 3/4) moist; weak fine and medium subangular blocky structure; very hard, firm; 20 percent by volume rounded chert fragments ½ inch to 1 inch across; 15 percent by volume soft masses, threads and fine nodules of calcium carbonate; strongly effervescent; moderately alkaline; abrupt smooth boundary.

BCk—27 to 80 inches; pink (7.5YR 8/3) caliche with gravelly clay loam texture, pink (7.5YR 7/3) moist; weak fine subangular blocky structure; very hard, firm; weakly cemented with fractures in the upper 1 inch; 15 percent by volume rounded chert fragments ½ inch to 1 inch across; violently effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 60 inches

Thickness of mollic epipedon: 10 to 20 inches Depth to bedrock: More than 60 inches Content of rock fragments: 15 to 80 percent

A horizon:

Hue—5YR to 10YR

Value—3 to 5

Chroma-2 or 3

Texture—very gravelly sandy clay loam

Bt horizon:

Hue-2.5YR to 7.5YR

Value—3 or 4

Chroma-2 to 4

Texture—clay loam or clay

BCk horizon:

Hue—7.5YR or 10YR

Value—7 or 8

Chroma—1 to 3

Texture—caliche with loam or clay loam texture

Imogene Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Very slow

Landform: Low stream terrace

Parent material: Saline loamy sediments

Slope range: 0 to 1 percent Associated soils: Sinton, Buchel

Taxonomic class: Fine-loamy, mixed, superactive, hyperthermic Mollic Natrustalfs

Typical Pedon

Imogene fine sandy loam, 0 to 1 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, north 13.9 miles on U.S. Highway 281, north 10.7 miles on Interstate 37, west 2.7 miles on Farm Road 99 and 300 feet west in pasture; USGS Whitsett, Texas topographic quadrangle; lat. 28 degrees 37 minutes 43 seconds N. and long. 98 degrees 16 minutes 47 seconds W.

A—0 to 8 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium prismatic and moderate fine and

medium subangular blocky structure; slightly hard, friable, nonsticky and slightly plastic; common very fine, fine, and common medium roots; few very fine and fine tubular pores; nonsaline; SAR is 1.8; slightly acid; abrupt smooth boundary.

- Btn1—8 to 15 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate medium prismatic and moderate fine and medium subangular blocky structure; slightly hard, firm, slightly sticky and slightly plastic; common very fine, fine, and few medium roots; few very fine and fine tubular pores; few faint clay films on ped faces; nonsaline; SAR is 10.2; slightly alkaline; clear smooth boundary.
- Btn2—15 to 27 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate medium prismatic and moderate fine and medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; common very fine, fine, and few medium roots; common very fine and fine tubular pores; common faint clay films on ped faces; very slightly saline; SAR is 16.8; moderately alkaline; gradual smooth boundary.
- Btn3—27 to 36 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic and moderate fine and medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few very fine and fine roots; common very fine and fine tubular pores; few faint clay films on ped faces; slightly saline; SAR is 23.3; moderately alkaline; gradual smooth boundary.
- Btnz1—36 to 51 inches; dark grayish brown (10YR 4/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic and moderate fine and medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few very fine and fine roots; common very fine and fine tubular pores; few faint clay films on ped faces; common fine black (10YR 2/1) spots; 2 percent by volume threads and masses of very fine crystals of salts more soluble than gypsum; common fine gypsum threads; moderately saline; SAR is 17.0; moderately alkaline; gradual smooth boundary.
- Btnz2—51 to 69 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic and moderate fine and medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; few very fine and fine roots; common very fine and fine tubular pores; few faint clay films on ped faces; common fine black (10YR 2/1) spots; 2 percent by volume threads and masses of very fine crystals of salts more soluble than gypsum; common fine gypsum threads; moderately saline; SAR is 17.3; moderately alkaline; gradual smooth boundary.
- Btnz3—69 to 80 inches; grayish brown (10YR 5/2) sandy clay loam, dark grayish brown (10YR 4/2) moist; moderate medium prismatic and moderate fine and medium subangular blocky structure; very hard, firm, moderately sticky and moderately plastic; common very fine and fine tubular pores; few faint clay films on ped faces; 1 percent by volume threads and masses of very fine crystals of salts more soluble than gypsum; few fine gypsum threads; moderately saline; SAR is 17.4; moderately alkaline.

Range in Characteristics

Solum thickness: More than 80 inches
Thickness of mollic epipedon: 7 to 15 inches
Depth to bedrock: More than 80 inches
Depth to a natric horizon: Less than 12 inches
Content of rock fragments: Less than 15 percent

A horizon:

Hue—10YR Value—3 to 5 Chroma—1 to 4

Texture—fine sandy loam

Btn and Btnz horizons:

Hue-7.5YR to 2.5Y

Value—3 to 7

Chroma—1 to 4

Texture—sandy clay loam, clay loam, or sandy clay

Lacoste Series

Depth class: Very shallow and shallow over a petrocalcic horizon

Drainage class: Well drained Permeability: Moderate Landform: Interfluve

Parent material: Calcareous, loamy alluvium

Slope range: 0 to 3 percent

Associated soils: Pettus, Olmos, Parrita, Goliad

Taxonomic class: Loamy, mixed, active, hyperthermic shallow Petrocalcic Paleustalfs

Typical Pedon

Lacoste fine sandy loam, 0 to 3 percent slopes (fig. 26); in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, south 15.6 miles on U.S. Highway 281, east 3.0 miles on Farm Road 3162, southwest 1.0 mile on county road, west 0.2 mile on private ranch road and 50 feet south in rangeland; USGS Midway, Texas topographic quadrangle; lat. 28 degrees 5 minutes 42 seconds N. and long. 98 degrees 3 minutes 44 seconds W.

- A—0 to 4 inches; strong brown (7.5YR 4/6) fine sandy loam, dark brown (7.5YR 3/4) moist; moderate fine and medium subangular blocky structure; soft, very friable; many very fine and fine roots; few fine tubular pores; noneffervescent; slightly acid; clear smooth boundary.
- Bt1—4 to 10 inches; yellowish red (5YR 4/6) sandy clay loam, dark reddish brown (5YR 3/4) moist; weak coarse prismatic and weak fine and medium subangular blocky structure; slightly hard, friable; common very fine, fine, and few medium roots; common very fine and fine tubular pores; few faint clay films on ped faces; noneffervescent; slightly acid; clear smooth boundary.
- Bt2—10 to 13 inches; dark reddish brown (5YR 3/4) sandy clay loam, reddish brown (2.5YR 5/4) moist; moderate coarse prismatic and weak fine and medium subangular blocky structure; hard, firm; common very fine, fine, and few medium roots matted at top of horizon; common fine and medium tubular pores; common distinct clay films on ped faces and in pores; noneffervescent; neutral; abrupt wavy boundary.
- Bkm1—13 to 22 inches; very pale brown (10YR 8/3), strongly cemented caliche; very pale brown (10YR 8/3) moist; massive; few fine and medium roots along fracture seams; fractured at intervals of 1 foot or more; 5 percent B soil material between fractures; series of laminar caps ½ inch in thickness, 1 inch to 3 inches apart; violently effervescent; moderately alkaline; abrupt smooth boundary.
- Bkm2—22 to 33 inches; white (10YR 8/1), strongly cemented caliche; white (10YR 8/1) moist; massive; white strongly cemented calcium carbonate with ½ inch thick laminar cap; few fine and medium roots matted on surface of laminar cap; violently effervescent; moderately alkaline; abrupt smooth boundary.
- Bkm3—33 to 80 inches; white (10YR 8/1), moderately cemented caliche; white (10YR 8/1) moist; massive; violently effervescent; moderately alkaline.



Figure 26.—Profile of Lacoste fine sandy loam, 0 to 3 percent slopes. Between depths of 13 inches and 22 inches, there is an area in which the caliche layer is undergoing the weathering process.

Range in Characteristics

Solum thickness: Less than 20 inches Depth to bedrock: Less than 20 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—5YR or 7.5YR Value—4 or 5 Chroma—2 to 6

Texture—fine sandy loam

Bt horizon:

Hue—2.5YR or 5YR Value—3 to 5 Chroma—4 to 6

Texture—fine sandy loam or sandy clay loam

Bkm horizon: Strongly cemented caliche BCk Horizon: Weakly cemented caliche

Laparita Series

Depth class: Very deep Drainage class: Well drained Permeability: Moderately slow

Landform: Interfluve

Parent material: Saline, loamy and clayey marine sediments

Slope range: 1 to 3 percent

Associated soils: Campbellton, Esseville

Taxonomic class: Fine, smectitic, hyperthermic, Vertic Argiustolls

Typical Pedon

Laparita sandy clay loam, 1 to 3 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, north 13.9 miles on U.S. Highway 281, north 10.7 miles on Interstate 37, west 6.0 miles on Farm Road 99, south and east 2.3 miles on county road and 600 feet south in pasture; USGS Willow Hollow Tank, Texas topographic quadrangle; lat. 28 degrees 34 minutes 42 seconds N. and long. 98 degrees 16 minutes 11 seconds W.

- A—0 to 6 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark brown (10YR 2/2) moist; massive; common fine roots; noneffervescent; slightly acid; clear smooth boundary.
- Bt1—6 to 16 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium angular blocky structure; few fine pores; common fine roots; common distinct clay films on ped faces; noneffervescent; neutral; gradual wavy boundary.
- Bt2—16 to 25 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; strong fine and medium angular blocky structure; common fine and medium roots; few fine pores; common distinct clay films on ped faces; few nonintersecting slickensides; noneffervescent; neutral; gradual wavy boundary.
- Btk—25 to 42 inches; brown (10YR 5/3) clay, brown (10YR 4/3) moist; moderate fine and medium angular blocky structure; common fine roots; few very fine and fine pores; very few faint clay films on ped faces few nonintersecting slickensides; common soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.
- BCk—42 to 61 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak fine subangular blocky structure; few fine roots; few fine pores; few medium soft masses of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.
- Cyz—61 to 80 inches; brownish yellow (10YR 6/8) weakly cemented sandstone with soft siltstone fragments; yellowish brown (10YR 5/8) moist; massive; 4 percent by volume gypsum crystals and pockets of neutral salts; slightly saline; noneffervescent; slightly alkaline.

Range in Characteristics

Solum thickness: More than 40 inches Thickness of mollic epipedon: 10 to 30 inches Depth to bedrock: More than 60 inches

Content of rock fragments: Less than 10 percent

A horizon:

Hue—10YR Value—3 or 4 Chroma—1 or 2 Texture—sandy clay loam

Bt and Btk horizons:

Hue—10YR

Value—2 to 5

Chroma—1 to 3

Texture—clay loam, sandy clay, or clay

BC horizon:

Hue—10YR

Value—5 to 7

Chroma—1 to 4

Texture—sandy clay loam, clay loam, or clay

Cyz horizon:

Hue—10YR

Value—5 to 7

Chroma—6 to 8

Texture—weakly cemented sandstone with soft siltstone fragments

Lattas Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Very slow Landform: Flat plain

Parent material: Clayey fluviomarine sediments

Slope range: 0 to 3 percent Associated soils: Clareville, Coy

Taxonomic class: Fine, smectitic, hyperthermic, Typic Haplusterts

Typical Pedon

Lattas clay, 0 to 1 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, 5.5 miles east on U.S. Highway 59, south 9.5 miles on Interstate 37, east 3.5 miles on Farm Road 534, north 1.3 miles on field road and 50 feet west in cropland; USGS Mulos Hills, Texas topographic quadrangle; lat. 28 degrees 17 minutes 24 seconds N. and long. 97 degrees 52 minutes 43 seconds W.

- Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine granular structure; very hard, firm; few very fine and fine roots; few snail shell fragments; few small quartz pebbles less than 1 centimeter across; noneffervescent; slightly alkaline; abrupt smooth boundary.
- A—6 to 14 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; weak medium and coarse angular blocky structure; extremely hard, very firm; few very fine and fine roots; few fine tubular pores; few small quartz pebbles less than 1 centimeter across; slightly effervescent; slightly alkaline; clear wavy boundary.
- Bss1—14 to 24 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; weak medium and coarse angular blocky structure; extremely hard, very firm; few very fine and fine roots; few fine tubular pores; common large intersecting slickensides; few small quartz pebbles less than 1 centimeter across; slightly effervescent; slightly alkaline; clear wavy boundary.
- Bss2—24 to 36 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak medium and coarse angular blocky structure; extremely hard, very firm; few very fine and fine roots; few fine tubular pores; common black (10YR 2/1) and light yellowish brown (2.5Y 6/3) krotovinas; many large intersecting slickensides; few small quartz pebbles less than 1 centimeter across; strongly effervescent; moderately alkaline; clear wavy boundary.

- Bss3—36 to 45 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; weak medium and coarse angular blocky structure; extremely hard, very firm; few very fine and fine roots; few fine tubular pores; many large intersecting slickensides; common black (10YR 2/1) and light yellowish brown (2.5Y 6/3) krotovinas; few fine soft masses of calcium carbonate; few small quartz pebbles less than 1 centimeter across; strongly effervescent; moderately alkaline; clear wavy boundary.
- BCssk1—45 to 52 inches; 75 percent light gray (2.5Y 7/2) clay, grayish brown (2.5Y 5/2) moist, and 25 percent dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine and medium subangular blocky structure; very hard, very firm; few very fine and fine roots; common fine and medium tubular pores; common large intersecting slickensides; common soft masses of calcium carbonate; few small quartz pebbles less than 1 centimeter across; strongly effervescent; moderately alkaline; gradual smooth boundary.
- BCssk2—52 to 64 inches; light gray (2.5Y 7/2) clay, light brownish gray (2.5Y 6/2) moist; moderate fine and medium subangular blocky structure; very hard, firm; few very fine and fine roots; common fine and medium tubular pores; less 2 percent coatings of very dark gray (10YR 3/1) soil material along old cracks; few large intersecting slickensides; few fine iron-manganese concretions; common fine and medium prominent strong brown (7.5YR 4/6) redox concentrations; common soft masses of calcium carbonate; few fine masses of gypsum; few small quartz pebbles less than 1 centimeter across; strongly effervescent; slightly alkaline; clear smooth boundary.
- BCky1—64 to 80 inches; light gray (2.5Y 7/2) clay, light yellowish brown (2.5Y 6/3) moist; common medium prominent strong brown (7.5YR 4/6) mottles; moderate fine and medium subangular blocky structure; very hard, firm; few very fine and fine roots; common fine and medium tubular pores; few fine iron-manganese concretions; less than 2 percent gypsum crystals and soft masses; less than 1 percent spots of very dark gray (10YR 3/1) soil material; common soft masses of calcium carbonate; few small quartz pebbles less than 1 centimeter across; strongly effervescent; slightly alkaline; gradual smooth boundary.

Range in Characteristics

Solum thickness: More than 80 inches
Thickness of mollic epipedon: 12 to 56 inches
Depth to bedrock: More than 80 inches
Depth to carbonates: Less than 40 inches
Content of rock fragments: Less than 10 percent
Ap or A horizon:
Hue—10YR

Hue—10YR
Value—3 or 4
Chroma—1
Texture—clay

Bss or Bkss horizon:
Hue—10YR

Value—4 to 6
Chroma—1 or 2
Texture—clay loam, silty clay, or clay

BCssk or BCssky horizon: Hue—10YR or 2.5Y Value—6 to 8

Chroma—1 to 4
Texture—clay loam, silty clay, or clay

Mata Series

Depth class: Very deep Drainage class: Well drained Permeability: Moderate

Landform: Ridge

Parent material: Gravelly loamy alluvium overlying clayey alluvium

Slope range: 3 to 8 percent Associated soils: Hindes, Olmos

Taxonomic class: Loamy-skeletal, mixed, superactive, hyperthermic, Aridic Calciustepts

Typical Pedon

Mata gravelly clay loam, 3 to 8 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles north on U.S. Highway 281, north 10.7 miles on Interstate 37, west 10.3 miles on Farm Road 99, east and south 3.1 miles on private ranch road and 100 feet east in rangeland; USGS Willow Hollow Tank, Texas topographic quadrangle; lat. 28 degrees 31 minutes 12 seconds N. and long. 98 degrees 19 minutes 39 seconds W.

- A—0 to 5 inches; dark grayish brown (10YR 4/2) gravelly clay loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; hard, firm; common fine and few medium roots; few fine nodules of calcium carbonate; 30 percent by volume rounded quartz pebbles ½ inch to 2 inches across; strongly effervescent; slightly alkaline; clear smooth boundary.
- Bk—5 to 17 inches; grayish brown (10YR 5/2) very gravelly clay loam, dark grayish brown (10YR 4/2) moist; weak fine subangular blocky structure; hard, firm; common fine and few medium roots; common fine nodules and threads of calcium carbonate; 55 percent by volume of rounded quartz fragments and pebbles ¼ inch to 3 inches across; 5 percent by volume of rounded quartz cobbles that are 3 inches to 5 inches across; strongly effervescent; moderately alkaline; clear wavy boundary.
- Bkz1—17 to 31 inches; light brownish gray (10YR 6/2) very gravelly clay loam, grayish brown (10YR 5/2) moist; weak fine subangular blocky structure; hard, firm; few fine and medium roots; common fine threads of salts; common fine and medium nodules and threads of calcium carbonate; 35 percent by volume rounded quartz pebbles and gravels ¼ inch to 2 inches across; violently effervescent; moderately alkaline; clear wavy boundary.
- Bkz2—31 to 44 inches; light gray (10YR 7/2) gravelly clay loam, light brownish gray (10YR 6/2) moist; weak fine subangular blocky structure; hard, firm; few fine roots; many fine threads and common fine nodules of calcium carbonate; common fine threads and masses of salts; 25 percent by volume rounded quartz pebbles from 1/4 inch to 2 inches across; violently effervescent; moderately alkaline; abrupt smooth boundary.
- 2Cd1—44 to 56 inches; yellow (2.5Y 7/6) noncemented sandstone with loam texture, olive yellow (2.5Y 6/6) moist; massive; very hard, friable; common fine faint brownish yellow (10YR 6/6) mottles; few fine soft masses of calcium carbonate; common soft masses of gypsum crystals and other salts; slightly effervescent; slightly alkaline; abrupt smooth boundary.
- 2Cd2—56 to 80 inches; light yellowish brown (2.5Y 6/4) noncemented claystone with clay loam texture, light olive brown (2.5Y 5/4) moist; massive; very hard, firm; common fine and medium soft masses of gypsum and other salts; slightly effervescent; slightly alkaline.

Range in Characteristics

Solum thickness: 40 to 60 inches

Depth to bedrock: 40 to 60 inches

Content of rock fragments: 35 to 60 percent

A horizon:

Hue—7.5YR or 10YR

Value—4 to 7

Chroma-2 to 4

Texture—gravelly clay loam

Bk and Bkz horizons:

Hue-7.5YR or 10YR

Value—5 to 8

Chroma-2 to 4

Texture—fine sandy loam, sandy loam, loam, or sandy clay loam or their gravelly counterparts

2Cd horizon:

Hue-10YR or 2.5Y

Value—6 to 8

Chroma—1 to 4

Texture—soft shale intermingled with clay loam or clayey texture

Monteola Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Very slow Landform: Interfluve

Parent material: Calcareous, clayey alluvium

Slope range: 0 to 3 percent

Associated soils: Pernitas, Coy, Cotulla

Taxonomic class: Fine, smectitic, hyperthermic, Typic Haplusterts

Typical Pedon

Monteola clay, 0 to 1 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West, north 10.0 miles on U.S. Highway 281, northeast 7.7 miles on Texas Highway 72, north 3.1 miles on Farm Road 2049, east 1.5 miles on county road and 1,000 feet east in cropland; USGS Ray Point, Texas topographic quadrangle; lat. 28 degrees 34 minutes 6 seconds N. and long. 98 degrees 3 minutes 36 seconds W.

- Ap—0 to 6 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; weak fine and medium subangular blocky structure; very hard, very firm; common fine and medium roots; few fine pores; few snail shell fragments; few insect casts; slightly effervescent; slightly alkaline; clear smooth boundary.
- A—6 to 24 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine and medium angular blocky structure; very hard, very firm, very sticky and very plastic; common fine roots; common fine pores; common fine pressure surfaces; few nonintersecting slickensides in lower part; few fine calcium carbonate concretions; few snail shell fragments; few insect casts; slightly effervescent; moderately alkaline; gradual wavy boundary.
- Bss—24 to 40 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; common fine roots; few fine pores; common pressure surfaces; common prominent intersecting slickensides; few very dark gray (10YR 3/1) vertical streaks; few fine calcium carbonate concretions; few snail

shell fragments; slightly effervescent; moderately alkaline; gradual wavy boundary.

Bkss—40 to 54 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate medium prismatic and weak fine and medium angular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; few very fine and fine pores; common prominent intersecting slickensides; common pressure surfaces; few fine calcium carbonate concretions; strongly effervescent; moderately alkaline; gradual wavy boundary.

Bkssz—54 to 80 inches; light brownish gray (10YR 6/2) clay, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; extremely hard, very firm, very sticky and very plastic; few fine roots; few very fine and fine pores; few nonintersecting slickensides; few pressure surfaces; few soft masses of calcium carbonate; common masses of salt; slightly saline; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 80 inches

Thickness of mollic epipedon: 20 to 50 inches Depth to bedrock: More than 80 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—10YR

Value—3 or 4

Chroma—1

Texture—clay

Bss horizon:

Hue-10YR or 2.5Y

Value—4 to 7

Chroma—1 to 4

Texture—clay

Bkss and Bkssz horizons:

Hue—10YR or 2.5Y

Value—5 to 8

Chroma—1 to 8

Texture—clay

Nusil Series

Depth class: Very deep Drainage class: Well drained

Permeability: Slow

Landform: Stream terraces

Parent material: Loamy alluvium overlain by recent eolian sands

Slope range: 1 to 5 percent

Associated soils: Papalote, Rhymes

Taxonomic class: Loamy, siliceous, active, hyperthermic Arenic Paleustalfs

Typical Pedon

Nusil fine sand, 1 to 5 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south on U.S. Highway 281 15.0 miles, east 8.3 miles on Farm Road 3162, southwest 1.2 miles on private ranch road and 500 feet northwest in pasture; USGS Midway, Texas topographic

quadrangle; lat. 28 degrees 6 minutes 11 seconds N. and long. 98 degrees 1 minute 3 seconds W.

- A—0 to 29 inches; pale brown (10YR 6/3), crushed, fine sand, brown (10YR 5/3), crushed, moist; weak fine granular structure; loose, very friable, nonsticky and nonplastic; many very fine and fine roots; common fine vesicular and tubular pores; slightly acid; clear smooth boundary.
- E—29 to 37 inches; very pale brown (10YR 7/4), exterior, fine sand, light yellowish brown (10YR 6/4), exterior, moist; weak fine granular structure; loose, very friable, nonsticky and nonplastic; many fine roots; common fine vesicular and tubular pores; slightly acid; abrupt wavy boundary.
- Bt1—37 to 40 inches; light brownish gray (10YR 6/2), exterior, sandy clay loam, grayish brown (10YR 5/2), exterior, moist; weak medium prismatic and moderate fine and medium angular blocky structure; very hard, very firm, slightly sticky and slightly plastic; common fine roots; common fine vesicular and tubular pores; few distinct clay films on ped faces and in pores; common fine and medium yellowish brown (10YR 5/8) and common fine prominent red (2.5YR 4/6) redox concentrations; neutral; clear smooth boundary.
- Bt2—40 to 54 inches; light gray (10YR 7/2), exterior, sandy clay loam, light brownish gray (10YR 6/2), exterior, moist; weak medium prismatic and moderate fine and medium angular blocky structure; very hard, very firm, slightly sticky and slightly plastic; common fine roots; common fine vesicular and tubular pores; few distinct clay films on faces of peds and in pores; common fine and medium prominent red (2.5YR 4/6), common fine distinct brownish yellow (10YR 6/6), and common fine and medium prominent yellowish red (5YR 4/6) redox concentrations; slightly alkaline; gradual smooth boundary.
- Bt3—54 to 70 inches; light yellowish brown (10YR 6/4), exterior, sandy clay loam, yellowish brown (10YR 5/4), exterior, moist; weak medium prismatic and moderate fine and medium subangular blocky structure; very hard, very firm, slightly sticky and slightly plastic; common fine vesicular and tubular pores; few distinct clay films on faces of peds and in pores; common fine and medium distinct light gray (10YR 7/2) redox depletions; common fine and medium distinct reddish yellow (7.5YR 6/6) redox concentrations; slightly alkaline; gradual smooth boundary.
- Bt4—70 to 80 inches; brownish yellow (10YR 6/6), exterior, sandy clay loam, yellowish brown (10YR 5/6), exterior, moist; weak medium prismatic and moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; common fine vesicular and tubular pores; few distinct clay films on ped faces and in pores; common fine and medium distinct light gray (10YR 7/2) redox depletions; common fine and medium distinct reddish yellow (7.5YR 6/6) redox concentrations; slightly alkaline.

Range in Characteristics

Solum thickness: More than 80 inches
Depth to bedrock: More than 80 inches
Depth to carbonates: More than 36 inches
Content of rock fragments: Less than 10 percent

A horizon:

Hue—7.5YR or 10YR Value—4 to 6 Chroma—2 to 4 Texture—fine sand

E horizon:

Hue—7.5YR or 10YR

Value—6 or 7 Chroma—2 to 4

Texture—fine sand or loamy fine sand

Bt horizon:

Hue—7.5YR or 10YR Value—6 or 7 Chroma-2 to 6

Texture—fine sandy loam or sandy clay loam

Odem Series

Depth class: Very deep Drainage class: Well drained Permeability: Moderately rapid

Landform: Natural levee Parent material: Loamy alluvium

Slope range: 0 to 1 percent Associated soils: Buchel, Sinton

Taxonomic class: Coarse-loamy, mixed, superactive, hyperthermic, Cumulic Haplustolls

Typical Pedon

Odem fine sandy loam, 0 to 1 percent slopes, occasionally flooded; in Live Oak, County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south 18.8 miles on U.S. Highway 281 and 1,200 feet east in rangeland along creek; USGS Midway, Texas topographic quadrangle; lat. 28 degrees 4 minutes 4 seconds N. and long. 98 degrees 5 minutes 18 seconds W.

- A1—0 to 7 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; common very fine, fine and few medium roots; few fine tubular pores; few insect casts; noneffervescent; slightly alkaline; gradual smooth boundary.
- A2—7 to 24 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine, fine and few medium roots; few fine tubular pores; few insect casts; noneffervescent; slightly alkaline; gradual smooth boundary.
- Bw—24 to 39 inches; pale brown (10YR 6/3) fine sandy loam, brown (10YR 5/3) moist; weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and nonplastic; common very fine and fine roots; few fine tubular pores; few snail shell fragments; few insect casts; few fine threads of calcium carbonate slightly effervescent; slightly alkaline; gradual smooth boundary.
- Bk—39 to 80 inches; very pale brown (10YR 7/3) fine sandy loam, light yellowish brown (10YR 6/4) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; few very fine roots; few fine tubular pores; few snail shell fragments; few insect casts; few fine threads of calcium carbonate; few fine and medium concretions of calcium carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 60 inches

Thickness of mollic epipedon: 10 to 36 inches Depth to bedrock: More than 80 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—10YR

Value—3 to 5

Chroma—1 to 3

Texture—fine sandy loam

Bw horizon:

Hue—10YR

Value—3 to 7

Chroma—1 to 3

Texture—fine sandy loam or loam

Bk horizon:

Hue—10YR

Value—5 to 7

Chroma—2 to 3

Texture—fine sandy loam or loam

Olmos Series

Depth class: Very shallow and shallow over petrocalcic layer

Drainage class: Well drained Permeability: Moderate Landform: Interfluve

Parent material: Calcareous loamy alluvium

Slope range: 1 to 8 percent

Associated soils: Pettus, Lacoste, Sarnosa, Mata

Taxonomic class: Loamy-skeletal, carbonatic, hyperthermic shallow Petrocalcic

Calciustolls

Typical Pedon

Olmos very gravelly sandy loam, 1 to 8 percent slopes (fig. 27); in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, east 5.5 miles on U.S. Highway 59, southeast 9.3 miles on Interstate 37, west 5.4 miles on Farm Road 534, southwest and south 2.9 miles on county road and 500 feet east in rangeland; USGS Crater Ridge, Texas topographic quadrangle; lat. 28 degrees 10 minutes 51 seconds N. and long. 98 degrees 0 minutes 47 seconds W.

- A1—0 to 8 inches; very dark grayish brown (10YR 3/2) very gravelly sandy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky and granular structure; soft, very friable, nonsticky and nonplastic; many fine roots; few snail shell fragments; common fine irregular nodules of calcium carbonate; common wormcasts; contains 71 percent by weight indurated platy and irregular shaped caliche fragments with 5 percent larger than 3 inches and 37 percent smaller than 3/4 inch across; contains 58 percent by volume fragments coarser than sand; strongly effervescent; slightly alkaline; clear wavy boundary.
- A2—8 to 18 inches; brown (10YR 4/3) extremely gravelly sandy loam, dark brown (10YR 3/3) moist; weak fine granular structure; soft, very friable, nonsticky and nonplastic; common fine and medium roots; few snail shell fragments; common fine irregular nodules of calcium carbonate; common wormcasts; contains 78 percent by weight indurated platy and irregular shaped caliche fragments with 15 percent larger than 3 inches and 37 percent smaller than 3/4 inch across; contains 62 percent by volume fragments coarser than sand; violently effervescent; moderately alkaline; abrupt smooth boundary.

Bkm—18 to 30 inches; 70 percent white (10YR 8/1) and 30 percent very pale brown (10YR 8/3), indurated caliche; 70 percent white (10YR 8/1) and 30 percent very

pale brown (10YR 7/3) moist; massive; extremely hard, extremely firm, nonsticky and nonplastic; common fine and medium roots matted on top petrocalcic and along fractured seams; violently effervescent; moderately alkaline; gradual wavy boundary.

- BCk1—30 to 41 inches; white (10YR 8/1), weakly cemented caliche; white (10YR 8/1) moist; massive; extremely hard, very firm, nonsticky and nonplastic; few fine roots in cracks; common fine and medium masses of calcium carbonate; violently effervescent; moderately alkaline; gradual wavy boundary.
- BCk2—41 to 51 inches; white (10YR 8/1), weakly cemented caliche; white (10YR 8/1) moist; massive; extremely hard, very firm, nonsticky and nonplastic; few fine roots in cracks; common fine and medium masses of calcium carbonate; violently effervescent; strongly alkaline; gradual wavy boundary.
- BCk3—51 to 61 inches; white (10YR 8/1), weakly cemented caliche; white (10YR 8/1) moist; massive; extremely hard, very firm, nonsticky and nonplastic; few fine roots in cracks; common fine and medium masses of calcium carbonate; contains 2 percent by volume rounded chert fragments; contains 20 percent by volume rounded weakly cemented calcium carbonate fragments; violently effervescent; moderately alkaline; gradual wavy boundary.
- BCk4—61 to 75 inches; white (10YR 8/1), weakly cemented caliche; white (10YR 8/1) moist; massive; extremely hard, very firm, nonsticky and nonplastic; few fine roots in cracks; contains 20 percent by volume medium size calcite crystals surrounded

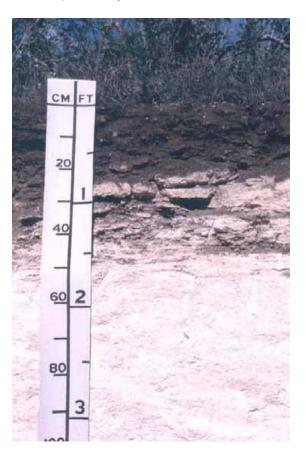


Figure 27.—Profile of Olmos very gravelly sandy loam, 1 to 8 percent slopes. Plant roots accumulate and form a mat when they contact the indurated caliche layer. Some roots enter cracks.

by soft powdery calcium carbonate; common fine and medium masses of calcium carbonate; contains 2 percent by volume rounded chert fragments; contains 20 percent by volume rounded weakly cemented calcium carbonate fragments; violently effervescent; moderately alkaline; gradual wavy boundary.

BCk5—75 to 80 inches; pink (7.5YR 7/3), weakly cemented caliche; light brown (7.5YR 6/4) moist; massive; extremely hard, very firm, nonsticky and nonplastic; few fine roots in cracks; contains 20 percent by volume rounded weakly cemented calcium carbonate fragments; contains 20 percent by volume medium size calcite crystals surrounded by soft powdery calcium carbonate; common fine and medium masses of calcium carbonate; contains 2 percent by volume rounded chert fragments; violently effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: Less than 20 inches

Thickness of the mollic epipedon: Less than 20 inches

Depth to petrocalcic layer: Less than 20 inches Content of rock fragments: 35 to 85 percent

A horizon:

Hue—7.5YR or 10YR Value—3 to 5

Chroma—1 to 3

Texture—very gravelly sandy loam

Bkm horizon: Strongly cemented or indurated caliche BCk Horizon: Weakly to moderately cemented caliche

Papalote Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Slow

Landform: Relict stream terrace

Parent material: Loamy fluviomarine sediments

Slope range: 0 to 3 percent

Associated soils: Weesatche, Clareville, Nusil, Rhymes

Taxonomic class: Fine, smectitic, hyperthermic Typic Paleustalfs

Typical Pedon

Papalote loamy fine sand, 0 to 3 percent slopes (fig. 28); in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south 15.0 miles on U.S. Highway 281, east 5.3 miles on Farm Road 3162; south 0.2 mile on private ranch road, southeast 0.3 mile and 1,500 feet northeast in pasture; USGS Midway, Texas topographic quadrangle; lat. 28 degrees 6 minutes 9 seconds N. and long. 98 degrees 3 minutes 21 seconds W.

- A—0 to 12 inches; dark grayish brown (10YR 4/2) loamy fine sand, very dark grayish brown (10YR 3/2) moist; weak medium subangular blocky structure; hard, very friable; many very fine and fine roots; few fine and medium tubular pores; noneffervescent; neutral; abrupt smooth boundary.
- Bt1—12 to 17 inches; gray (10YR 5/1) sandy clay, dark grayish brown (10YR 4/2) moist; strong coarse angular blocky structure; extremely hard, very firm; common very fine and fine roots; few medium tubular pores; common distinct very dark gray (10YR 3/1) clay films on ped faces; common distinct pressure surfaces;

common fine distinct dark yellowish brown (10YR 4/6) redox concentrations; noneffervescent; neutral; clear smooth boundary.

Bt2—17 to 26 inches; light brownish gray (10YR 6/2) sandy clay loam, grayish brown (10YR 5/2) moist; weak coarse prismatic and strong coarse angular blocky structure; extremely hard, very firm; common very fine and fine roots; few medium tubular pores; common distinct very dark gray (10YR 3/1) clay films on ped faces; common distinct pressure surfaces; few fine and medium distinct strong brown (7.5YR 4/6), common coarse faint light olive brown (2.5Y 5/3) and common fine prominent olive yellow (2.5Y 6/8) redox concentrations; few quartz pebbles; noneffervescent; slightly alkaline; clear smooth boundary.

Bt3—26 to 36 inches; strong brown (7.5YR 5/6) sandy clay loam, strong brown (7.5YR 4/6) moist; weak coarse prismatic and strong coarse angular blocky structure; extremely hard, very firm; few very fine and fine roots; few fine and medium tubular pores; common distinct dark grayish brown (10YR 4/2) clay films on faces of peds; few fine masses of carbonate; few medium prominent grayish brown (2.5Y 5/2) iron depletions; noneffervescent; moderately alkaline; clear smooth boundary.

Btk1—36 to 47 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak coarse angular blocky structure; extremely hard, firm; few very fine and fine roots; few medium tubular pores; few fine masses of iron-manganese accumulations; few fine and medium distinct yellowish brown (10YR 5/8) redox concentrations; common fine and medium masses of calcium carbonate; slightly effervescent; moderately alkaline; gradual smooth boundary.

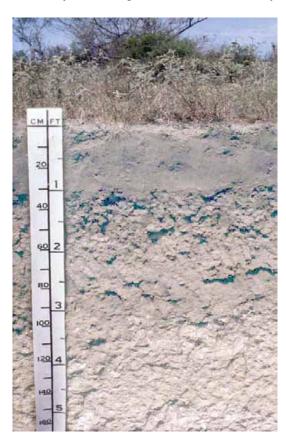


Figure 28.—Profile of Papalote loamy fine sand, 0 to 3 percent slopes. The abrupt texture change occurs at 12 inches, where the clayey layer begins.

Btk2—47 to 60 inches; light gray (10YR 7/2) sandy clay loam, pale brown (10YR 6/3) moist; weak coarse angular blocky structure; extremely hard, firm; few very fine and fine roots; few medium tubular pores; few fine masses of iron-manganese; many fine and medium distinct strong brown (7.5YR 5/6) redox concentrations; common fine faint light brownish gray (10YR 6/2) redox depletions; common fine and medium soft masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

BCk1—60 to 74 inches; very pale brown (10YR 8/2) sandy clay loam, light gray (10YR 7/2) moist; weak coarse angular blocky structure; extremely hard, firm; few very fine and fine roots; few medium tubular pores; few fine masses of iron-manganese; common fine and medium distinct brownish yellow (10YR 6/6) redox concentrations; common fine and medium masses of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.

BCk2—74 to 80 inches; white (10YR 8/1) sandy clay loam, light gray (10YR 7/1) moist; weak coarse subangular blocky structure; extremely hard, firm; few very fine and fine roots; few medium tubular pores; common masses of ironmanganese; common medium and coarse prominent dark yellowish brown (10YR 4/6) and common medium and coarse prominent strong brown (7.5YR 4/6) redox concentrations; common medium soft masses of calcium carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 80 inches Depth to bedrock: More than 80 inches Depth to carbonates: 28 to 40 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue-7.5YR or 10YR

Value—4 to 6

Chroma—1 to 4

Texture—loamy fine sand or fine sandy loam

E horizon (where present):

Hue—10YR

Value—4 to 8

Chroma—1 to 4

Texture—loamy fine sand or fine sandy loam

Bt and Btk horizon:

Hue-7.5YR or 10YR

Value—3 to 7

Chroma—1 to 8

Texture—sandy clay loam, clay loam, or sandy clay

BCk horizon:

Hue—5YR to 10YR

Value—5 to 8

Chroma—1 to 8

Texture—sandy clay loam or clay loam

Parrita Series

Depth class: Shallow to petrocalcic Drainage class: Well drained Permeability: Moderately slow

Landform: Interfluve

Parent material: Calcareous, loamy alluvium

Slope range: 1 to 3 percent

Associated soils: Goliad, Olmos, Lacoste, Weesatche

Taxonomic class: Clayey, mixed, active, hyperthermic, shallow Petrocalcic Paleustolls

Typical Pedon

Parrita fine sandy loam, 1 to 3 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south 12.8 miles on U.S. Highway 281, southeast 2,000 feet along fence, northeast 3,400 feet along fence and 400 feet north in pasture; USGS Crater Ridge, Texas topographic quadrangle; lat. 28 degrees 9 minutes 3 seconds N. and long. 98 degrees 5 minutes 30 seconds W.

- A—0 to 5 inches; dark grayish brown (10YR 4/2) fine sandy loam, very dark grayish brown (10YR 3/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; common fine and few medium roots; few fine pores; few insect casts; noneffervescent; slightly alkaline; clear smooth boundary.
- Bt1—5 to 11 inches; dark brown (7.5YR 3/4) sandy clay loam, dark brown (7.5YR 3/2) moist; moderate medium subangular blocky structure; hard, firm; common fine and few medium roots; common faint clay films on ped faces; few insect casts; noneffervescent; slightly alkaline; clear smooth boundary.
- Bt2—11 to 19 inches; dark reddish brown (5YR 3/4) sandy clay, dark brown (7.5YR 3/4) moist; moderate medium prismatic and moderate medium and coarse angular blocky structure; very hard, very firm; common fine roots; few fine pores; common distinct clay films on ped faces; few insect casts; noneffervescent; slightly alkaline; abrupt wavy boundary.
- Bkm—19 to 28 inches; white (10YR 8/1) indurated caliche; light gray (10YR 7/1) moist; that is laminar in the upper ½ inch; fractures occur at 1 foot intervals horizontally; violently effervescent; moderately alkaline; clear wavy boundary.
- BCk—28 to 80 inches; very pale yellow (10YR 8/2) caliche of sandy clay loam texture, light gray (10YR 7/2) moist; massive; hard, firm; 15 percent fine and medium quartz gravels; violently effervescent; moderately alkaline.

Range in Characteristics:

Solum thickness: Less than 20 inches

Thickness of mollic epipedon: Less than 20 inches

Depth to bedrock: Less than 20 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—5YR to 10YR

Value—3 or 4

Chroma—2 or 3

Texture—fine sandy loam

Bt1 horizon:

Hue-2.5YR to 7.5YR

Value—3 or 4

Chroma-2 to 6

Texture—sandy clay loam, sandy clay, or clay

Bt2 horizon:

Hue-2.5YR to 7.5YR

Value—2 to 5

Chroma-3 to 6

Texture—sandy clay or clay

Bkm horizon: Cemented or indurated caliche

BCk horizon: White or pink caliche with texture of loam or sandy clay loam

Pavelek Series

Depth class: Shallow to a Petrocalcic

Drainage class: Well drained

Permeability: Slow

Landform: Structural bench on ridge

Parent material: Clayey alluvium overlying tuffaceous siltstone

Slope range: 0 to 5 percent

Associated soils: Eloso, Choke, Sancajo

Taxonomic class: Clayey, smectitic, hyperthermic shallow Petrocalcic Calciustolls

Typical Pedon

Pavelek clay loam, 0 to 3 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 59 and U.S. Highway 281 in George West; north 10.0 miles on U.S. Highway 281, northeast 4.0 miles on Texas Highway 72, north 1.8 miles on county road, east 0.6 mile on private farm road and 500 feet north in field; USGS Ray Point, Texas topographic quadrangle; lat. 28 degrees 32 minutes 24 seconds N. and long. 98 degrees 6 minutes 46 seconds W.

- Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) clay loam, very dark gray (10YR 3/1) moist; weak fine granular structure; hard, firm; common very fine and fine roots; few fine tubular pores; 5 percent fragments of strongly cemented caliche less than 3 inches across; strongly effervescent; moderately alkaline; clear smooth boundary.
- A—6 to 12 inches; very dark grayish brown (10YR 3/2) clay, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; hard, firm; few very fine and fine roots; few fine tubular pores; 2 percent fragments of strongly cemented caliche from ½ inch to 3 inches across; strongly effervescent; moderately alkaline; clear wavy boundary.
- Bk—12 to 16 inches; very dark grayish brown (10YR 3/2) very gravelly clay, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; hard, firm; few very fine roots; few fine tubular pores; contains 50 percent fragments and nodules of calcium carbonate 1/16 inch to 1 inch across; contains 5 percent fragments of weakly cemented calcium carbonate 1 inch to 3 inches across and ½ inch to 3¼ inch thick; strongly effervescent; moderately alkaline; abrupt wavy boundary.
- Bkm—16 to 24 inches; light gray (10YR 7/2) strongly cemented caliche, light brownish gray (10YR 6/2) moist; massive; extremely hard, extremely firm; common fine roots matted on top of laminar cap; laminar cap is ½ inch to ¼ inch thick; fractures in upper 3 inches; fractures contain very dark grayish brown (10YR 3/2) clay; violently effervescent; moderately alkaline; abrupt smooth boundary.
- BCk—24 to 44 inches; very pale brown (10YR 8/3) weakly cemented caliche of silt loam texture; very pale brown (10YR 7/3) moist; massive; 20 percent brittle masses of noncalcareous siltstone; violently effervescent; moderately alkaline; gradual wavy boundary.
- 2Cd—44 to 80 inches; very pale brown (10YR 8/3) noncemented siltstone of silt loam texture; very pale brown (10YR 7/3) moist; massive; 20 percent threads and soft masses of calcium carbonate that decrease with depth; noneffervescent; moderately alkaline.

Range in Characteristics

Solum thickness: Less than 20 inches

Thickness of mollic epipedon: Less than 20 inches

Depth to bedrock: Less than 20 inches Content of rock fragments: 35 to 50 percent

A horizon:

Hue—10YR Value—2 to 4 Chroma—1 or 2 Texture—clay loam

Bk horizon:

Hue—10YR Value—3 to 6 Chroma—1 or 2

Texture—gravelly or very gravelly clay loam or clay

Bkm horizon:

Hue—10YR or 2.5Y Value—6 to 8 Chroma—1 to 3

Texture—weakly to strongly cemented caliche

BCk horizon:

Hue—7.5YR to 2.5Y Value—7 or 8 Chroma—1 to 3

Texture—weakly cemented caliche or calcareous siltstone with silt loam or loam texture

2Cd horizon:

Hue—7.5YR to 2.5Y Value—6 to 8 Chroma—1 to 4

Texture—noncemented siltstone with silt loam or loam texture

Pernitas Series

Depth class: Very deep Drainage class: Well drained Permeability: Moderate Landform: Ridge

Parent material: Calcareous loamy alluvium

Slope range: 1 to 5 percent

Associated soils: Weesatche, Clareville, Monteola

Taxonomic class: Fine-loamy, mixed, superactive, hyperthermic Typic Argiustolls

Typical Pedon

Pernitas fine sandy loam, 2 to 5 percent slopes (fig. 29); in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, east 5.5 miles on U.S. Highway 59, north 7.7 miles on Interstate 37, east 3.0 miles on Farm Road 1203 and 100 feet north in cropland; USGS Oakville, Texas topographic quadrangle; lat. 28 degrees 26 minutes 31 seconds N. and long. 98 degrees 2 minutes 55 seconds W.

- Ap—0 to 7 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky and weak fine granular structure; hard, friable, slightly sticky and slightly plastic; common very fine and few medium roots; common very fine and fine tubular pores; few snail shell fragments; 1 percent rounded chert fragments; 1 percent rounded weakly cemented calcium carbonate fragments; strongly effervescent; moderately alkaline; abrupt smooth boundary.
- Bt1—7 to 14 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 3/1) moist; weak medium prismatic and moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine and fine tubular pores; few faint very dark gray (10YR 3/1) clay films on vertical faces of peds; few snail shell fragments; 1 percent rounded chert fragments; 1 percent rounded weakly cemented calcium carbonate fragments; few fine irregular threads of calcium carbonate; common medium and coarse cylindrical wormcasts; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bt2—14 to 20 inches; 75 percent brown (10YR 5/3) and 25 percent dark grayish brown (10YR 4/2) sandy clay loam, 75 percent brown (10YR 4/3) and 25 percent very dark grayish brown (10YR 3/2) moist; moderate medium prismatic and moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine, and common tubular pores; few faint very dark grayish brown (10YR 3/2) clay films on vertical faces of peds; few snail shell fragments; 1 percent rounded chert fragments; 1 percent rounded weakly cemented calcium carbonate fragments; few fine irregular threads of calcium carbonate; common medium and coarse cylindrical wormcasts; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bt3—20 to 26 inches; yellowish brown (10YR 5/4) sandy clay loam, dark yellowish brown (10YR 4/4) moist; moderate medium and coarse prismatic and moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine, fine and common medium tubular pores; very few faint very dark grayish brown (10YR 3/2) clay films on vertical faces of peds; few snail shell fragments; 1 percent rounded chert fragments; 1 percent rounded weakly cemented calcium carbonate fragments; few fine irregular threads of calcium carbonate; common medium and coarse cylindrical wormcasts; violently effervescent; moderately alkaline; clear smooth boundary.
- Bt4—26 to 35 inches; brown (7.5YR 4/4) sandy clay, brown (7.5YR 4/4) moist; moderate medium and coarse prismatic and moderate medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine, fine, medium and coarse tubular pores; common faint dark yellowish brown (10YR 4/4) clay films on vertical faces of peds; few snail shell fragments; contains few quartz pebbles in lower part of horizon; common fine threads of calcium carbonate; common medium and coarse cylindrical wormcasts; violently effervescent; moderately alkaline; clear smooth boundary.
- Bk1—35 to 47 inches; pale brown (10YR 6/3) clay loam, brown (10YR 5/3) moist; weak medium prismatic and weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and fine roots; many very fine and fine tubular pores; few snail shell fragments; contains few quartz pebbles in lower part of horizon; common medium and coarse cylindrical wormcasts; few medium irregular calcium carbonate concretions; many medium and coarse irregular masses of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.
- Bk2—47 to 58 inches; very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) moist; weak medium prismatic and weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine and

fine roots; many very fine, fine and common medium and common coarse tubular pores; few snail shell fragments; contains few quartz pebbles in lower part of horizon; many medium and coarse irregular masses of calcium carbonate; few medium irregular calcium carbonate concretions; common medium and coarse cylindrical wormcasts; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk3—58 to 80 inches; very pale brown (10YR 7/4) loam, light yellowish brown (10YR 6/4) moist; weak medium prismatic and weak fine and medium subangular blocky structure; slightly hard, friable, slightly sticky and slightly plastic; few very fine roots; many very fine, fine and common medium and coarse tubular pores; few snail shell fragments; contains few quartz pebbles in lower part of horizon; common fine irregular threads of calcium carbonate; common medium irregular masses of calcium carbonate; common medium and coarse cylindrical wormcasts; violently effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 80 inches Thickness of mollic epipedon: 7 to 20 inches Depth to bedrock: More than 80 inches Depth to carbonates: 20 to 40 inches

Content of rock fragments: Less than 15 percent



Figure 29.—Profile of Pernitas fine sandy loam, 2 to 5 percent slopes. The influence of the accumulation of calcium carbonate on soil color is shown beginning at 36 inches.

A horizon:

Hue—10YR

Value—3 or 4

Chroma—1 to 3

Texture—fine sandy loam or sandy clay loam

Bt horizon:

Hue-7.5YR or 10YR

Value—3 to 7

Chroma-2 to 4

Texture—sandy clay loam, clay loam, or sandy clay

Bk horizon:

Hue-7.5YR or 10YR

Value—6 to 8

Chroma—2 to 4

Texture—sandy clay loam or clay loam

Pettus Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Interfluve

Parent material: Calcareous loamy alluvium

Slope range: 2 to 5 percent

Associated soils: Olmos, Sarnosa, Pernitas

Taxonomic class: Loamy-skeletal, carbonatic, hyperthermic, Typic Calciustolls

Typical Pedon

Pettus sandy clay loam, 2 to 5 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south 4.7 miles on U.S. Highway 281, southwest 6.2 miles on county road, south 0.5 miles on private ranch road and 100 feet east in rangeland; USGS Elm Creek, Texas topographic quadrangle; lat. 28 degrees 11 minutes 23 seconds N. and long. 98 degrees 9 minutes 0 seconds W.

- A—0 to 11 inches; dark gray (10YR 4/1) sandy clay loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; slightly hard, slightly firm; common fine and medium roots; common fine pores; few fine calcium carbonate concretions; 8 percent coarse fragments of calcium carbonate; few snail shell fragments; common wormcasts; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bk1—11 to 22 inches; gray (10YR 6/1) very gravelly loam, gray (10YR 5/1) moist; weak fine and medium subangular blocky structure; hard, firm; common fine roots; common fine pores; 40 percent by volume nodules and concretions of calcium carbonate ½ inch to ½ inch across; common wormcasts; violently effervescent; moderately alkaline; clear smooth boundary.
- Bk2—22 to 54 inches; light gray (10YR 7/2) very gravelly loam, light brownish gray (10YR 6/2) moist; weak fine and medium subangular blocky structure; hard, firm; few fine roots; common fine pores; 40 percent by volume nodules and concretions of calcium carbonate ¼ inch to ½ inch across; violently effervescent; moderately alkaline; clear smooth boundary.
- BCk—54 to 80 inches; white (10YR 8/1) gravelly fine sandy loam, light gray (10YR 7/1) moist; weak fine subangular blocky structure; soft, friable; few fine pores; 30 percent by volume concretions and nodules of calcium carbonate ½ inch to ½ inch

across; 5 percent by volume moderately cemented fragments of sandstone with coatings of calcium carbonate; moderately alkaline; violently effervescent.

Range in Characteristics

Solum thickness: More than 60 inches

Thickness of the mollic epipedon: 7 to 12 inches

Depth to bedrock: More than 60 inches Content of rock fragments: 35 to 80 percent

A horizon:

Hue—10YR

Value-4 or 5

Chroma—1 to 3

Texture—sandy clay loam

Bk horizon:

Hue—10YR

Value—5 to 7

Chroma—1 to 3

Texture—gravelly or very gravelly loam, or sandy clay loam

BCk horizon:

Hue—10YR

Value—6 to 8

Chroma—1 to 4

Texture—gravelly, very gravelly, extremely gravelly fine sandy loam, loam, or sandy clay loam

Picosa Series

Depth class: Very shallow Drainage class: Well drained Permeability: Moderate

Landform: Ridge

Parent material: Residuum weathered from weakly cemented interbedded tuffaceous

sandstones and shales Slope range: 1 to 5 percent

Associated soils: Laparita, Ecleto, Fashing, Campbellton

Taxonomic class: Loamy, mixed, superactive, hyperthermic, shallow Entic Haplustolls

Typical Pedon

Picosa sandy clay loam, 1 to 5 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles on U.S. Highway 281, north 10.7 miles on Interstate 37, west 4.4 miles on Farm Road 99, north 1.7 miles on county road, north 0.2 mile on private ranch road and 100 feet west in rangeland; USGS Willow Hollow Tank, Texas topographic quadrangle; lat. 28 degrees 37 minutes 19 seconds N. and long. 98 degrees 18 minutes 38 seconds W.

A—0 to 6 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; weak fine subangular blocky structure; hard, firm common fine roots; few fine pores; 10 percent by volume sandstone fragments from 1 to 3 inches across; noneffervescent; slightly alkaline; clear smooth boundary.

A/Cd—6 to 11 inches; brownish yellow (10YR 6/8) cobbly loam; yellowish brown (10YR 5/8) moist; weak fine subangular blocky structure; slightly hard, friable, common fine roots; few fine pores; 40 percent noncemented sandstone fragments

3 inches to 6 inches across; noneffervescent; slightly alkaline; abrupt smooth boundary.

Cd—11 to 80 inches; very pale yellow (10YR 8/2) noncemented sandstone, light gray (10YR 7/2) moist; massive; noneffervescent; slightly alkaline.

Range in Characteristics

Solum thickness: Less than 20 inches

Thickness of mollic epipedon: Less than 20 inches

Depth to bedrock: Less than 20 inches Content of rock fragments: 0 to 30 percent

A horizon:

Hue—10YR Value—3 to 5 Chroma—1 to 3

Texture—sandy clay loam

Cd horizon:

Hue—10YR Value—6 to 8 Chroma—1 to 3

Texture—noncemented sandstone and shale

Rhymes Series

Depth class: Very deep

Drainage class: Somewhat excessively drained

Permeability: Moderately slow Landform: Stream terrace

Parent material: Loamy alluvium overlain by eolian sands

Slope range: 1 to 5 percent Associated soils: Nusil, Papalote

Taxonomic class: Loamy, siliceous, active, hyperthermic Grossarenic Paleustalfs

Typical Pedon

Rhymes fine sand, 1 to 5 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south 15.0 miles on U.S. Highway 281, east 8.0 miles on Farm Road 3162, and 450 feet southwest in pasture; USGS Midway, Texas topographic quadrangle; lat. 28 degrees 6 minutes 49 seconds N. and long. 98 degrees 0 minutes 24 seconds W.

- A—0 to 11 inches; pale brown (10YR 6/3), fine sand, brown (10YR 4/3), moist; single grained; loose, very friable; many very fine, fine, and common medium roots; common fine tubular pores; slightly acid, clear smooth boundary.
- E1—11 to 65 inches; very pale brown (10YR 7/3), fine sand, pale brown (10YR 6/3), moist; single grained; loose, very friable; common fine roots; slightly acid; clear smooth boundary.
- E2—65 to 71 inches; very pale brown (10YR 8/3), fine sand, very pale brown (10YR 7/3), moist; single grained; loose, very friable; common very fine and few fine roots; neutral; abrupt wavy boundary.
- Bt—71 to 80 inches; strong brown (7.5YR 5/6), sandy clay loam, strong brown (7.5YR 4/6), moist; moderate medium and coarse angular blocky structure; very hard, firm; common very fine and few fine roots; common distinct clay films on ped faces and in pores; common medium distinct yellowish red (5YR 4/6) redox concentrations; neutral.

Range in Characteristics

Solum thickness: More than 80 inches Depth to bedrock: More than 80 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—7.5YR or 10YR Value—4 to 6 Chroma—2 to 4 Texture—fine sand

E horizon:

Hue—7.5YR or 10YR Value—6 to 8 Chroma—2 to 6

Texture—fine sand, loamy sand, or loamy fine sand

Bt horizon:

Hue—7.5YR or 10YR
Value—5 to 7
Chroma—2 to 6
Toyture—fine sandy loam or

Texture—fine sandy loam or sandy clay loam

Rosenbrock Series

Depth class: Deep

Drainage class: Well drained Permeability: Very slow Landform: Interfluve

Parent material: Clayey alluvium overlying noncemented siltstone

Slope range: 0 to 3 percent

Associated soils: Eloso, Choke, Pavelek

Taxonomic class: Fine, smectitic, hyperthermic Typic Haplusterts

Typical Pedon

Rosenbrock clay, 0 to 1 percent slopes, rarely flooded; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, north 13.9 miles on U.S. Highway 281, north 3.9 miles on Interstate 37, east 1.0 mile on Farm Road 2049, north 1.5 miles on county road and 50 feet west in pasture; USGS Comanche Hills, Texas topographic quadrangle; lat. 28 degrees 36 minutes 17 seconds N. and long. 98 degrees 11 minutes 0 seconds W.

- A—0 to 8 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate fine and medium subangular blocky structure; hard, firm; common very fine and fine roots; common fine and few medium pores; common wormcasts; slightly effervescent; slightly alkaline; clear smooth boundary.
- Bw—8 to 24 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium and coarse subangular blocky structure; hard, firm; common fine, few medium and very fine roots; common fine pores; common fine pressure surfaces; few snail shell fragments; few insect tunnels; few wormcasts; slightly effervescent; slightly alkaline; gradual smooth boundary.
- Bkss—24 to 52 inches; dark grayish brown (10YR 4/2) clay, very dark grayish brown (10YR 3/2) moist; moderate fine and medium angular blocky structure; hard, firm; few very fine and fine roots; few fine pores; common prominent intersecting slickensides; few fine pressure surfaces; common fine threads and few fine

concretions of calcium carbonate; few snail shell fragments; few wormcasts; strongly effervescent; moderately alkaline; gradual smooth boundary.

BCk—52 to 59 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak medium subangular blocky structure; slightly hard, friable; few very fine roots; few fine pores; few snail shell fragments; few threads of calcium carbonate; few fine nodules and concretions of calcium carbonate; violently effervescent; moderately alkaline; gradual smooth boundary.

2Cd/Bk—59 to 80 inches; 70 percent light gray (10YR 7/2) noncemented siltstone with loam texture, light brownish gray (10YR 6/2) moist; 30 percent of Bk horizon is light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; weak fine and medium subangular blocky structure; slightly hard, friable; few fine few fine threads of calcium carbonate; few fine nodules of calcium carbonate; violently effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: 40 to 60 inches

Thickness of mollic epipedon: 12 to 55 inches

Depth to siltstone: More than 60 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—10YR

Value—2 or 3

Chroma—1

Texture—clay

Bw horizon:

Hue—10YR

Value—2 to 6

Chroma—1 to 3

Texture— silty clay or clay

Bkss horizon:

Hue-10YR

Value—3 to 7

Chroma—1 to 4

Texture— silty clay or clay

BCk horizon:

Hue—10YR

Value—5 or 6

Chroma—2 or 3

Texture—clay loam, silty clay, or clay

2Cd/Bk horizon:

Hue-7.5YR or 10YR

Value—3 to 8

Chroma—1 to 4

Texture—2Cd part is noncemented tuffaceous siltstone with a texture of loam or silt loam; the Bk part is clay loam, silty clay, or clay

Sancajo Series

Depth class: Shallow over a petrocalcic

Drainage class: Well drained Permeability: Very slow

Landform: Ridge

Parent material: Loamy, gravelly alluvium overlying weakly cemented tuffaceous siltstone Slope range: 1 to 8 percent

Associated soils: Pavelek, Choke, Eloso

Taxonomic class: Loamy-skeletal, mixed, superactive, hyperthermic, shallow Petrocalcic

Calciustolls

Typical Pedon

Sancajo very gravelly loam, 1 to 8 percent slopes; in Live Oak County Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West; 10.0 miles north on U.S. Highway 281, 7.3 miles west on Texas Highway 72, 1.0 mile south on Farm Road 1545, 0.2 mile west on county road and 1,600 feet northwest in rangeland; USGS Calliham, Texas topographic quadrangle; lat. 28 degrees 26 minutes 14 seconds N. and long. 98 degrees 17 minutes 56 seconds W.

- A1—0 to 6 inches; dark grayish brown (10YR 4/2) very gravelly loam; very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable; common fine and few medium roots; few snail shell fragments; 5 percent fragments of calcium carbonate from degraded petrocalcic and 10 percent rounded chert fragments less than 3 inches across; 25 percent rounded chert fragments smaller than ¾ inch; strongly effervescent; moderately alkaline; clear wavy boundary.
- A2—6 to 11 inches; dark grayish brown (10YR 4/2) extremely cobbly loam; very dark grayish brown (10YR 3/2) moist; weak fine and medium granular structure; slightly hard, friable; common fine and few medium roots; few snail shell fragments; 60 percent fragments of calcium carbonate derived from degraded petrocalcic that are less than 10 inches across; 20 percent fragments of petrocalcic less than 3 inches across; strongly effervescent; moderately alkaline; abrupt smooth boundary.
- Bkm—11 to 18 inches; white (10YR 8/1) indurated caliche; light gray (10YR 7/1) moist; massive; fractures are 3 to 8 feet apart; violently effervescent; moderately alkaline; abrupt smooth boundary.
- BCk—18 to 38 inches; light gray (10YR 7/2) silt loam and noncemented siltstone with texture of silt loam; light brownish gray (10YR 6/2) moist; weak fine and medium granular structure; very hard, friable; 40 percent films, threads, and soft masses of calcium carbonate; violently effervescent; moderately alkaline; clear wavy boundary.
- Cd—38 to 80 inches; pale yellow (2.5Y 7/3) noncemented tuffaceous siltstone of silt loam texture; light yellowish brown (2.5Y 6/3) moist; massive; very hard firm; few films and threads of calcium carbonate between fractures that decrease with depth; strongly effervescent between fractures; noneffervescent in matrix; moderately alkaline.

Range in Characteristics

Solum thickness: Less than 20 inches

Thickness of mollic epipedon: 10 to 20 inches

Depth to bedrock: 20 to 40 inches to noncemented tuffaceous siltstone

Content of rock fragments: 25 to 80 percent

A horizon:

Hue—10YR Value—2 to 4 Chroma—1 to 3

Texture—very gravelly loam

Bkm horizon: Strongly cemented or indurated white caliche

BCk horizon:

Hue—10YR or 2.5Y Value—7 or 8 Chroma—1 to 3 Texture—silt loam or loam

Cd horizon:

Hue—10YR or 2.5Y Value—7 or 8 Chroma—1 or 3

Texture—noncemented tuffaceous siltstone with texture of silt loam or loam

Sarnosa Series

Depth class: Very deep

Drainage class: Moderately well drained

Permeability: Moderate Landform: Ridge

Parent material: Calcareous loamy alluvium

Slope range: 3 to 8 percent

Associated soils: Pernitas, Pettus, Olmos

Taxonomic class: Coarse-loamy, mixed, superactive, hyperthermic, Typic Calciustolls

Typical Pedon

Sarnosa fine sandy loam, 3 to 8 percent slopes (fig. 30); in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south on U.S. Highway 281 1.6 miles, east and south on county road 3.5 miles, northeast on private road 600 feet and 150 feet southeast in rangeland; USGS George West, Texas topographic quadrangle; lat. 28 degrees 16 minutes 31 seconds N. and long. 98 degrees 4 minutes 43 seconds W.

- Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) fine sandy loam, very dark gray (10YR 3/1) moist; weak fine subangular blocky and weak fine granular structure; slightly hard, friable, nonsticky and nonplastic; common very fine and fine, and few medium roots; common very fine and fine tubular pores; common snail shell fragments; contains 2 percent rounded chert pebbles; common wormcasts and termite casts; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bw1—6 to 13 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 3/1) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and nonplastic; common very fine and fine and few medium roots; many very fine, fine and common medium tubular pores; common snail shell fragments; contains 2 percent rounded chert fragments; common wormcasts and termite casts; strongly effervescent; moderately alkaline; gradual smooth boundary.
- Bw2—13 to 22 inches; brown (10YR 4/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots few medium roots; many very fine, fine and common medium tubular pores; common snail shell fragments; contains 2 percent rounded chert fragments; common wormcasts and termite casts; common fine threads of calcium carbonate; strongly effervescent; moderately alkaline; gradual smooth boundary.
- Bw3—22 to 34 inches; brown (10YR 5/3) sandy clay loam, dark grayish brown (10YR 4/2) moist; weak fine and medium subangular blocky structure; hard, friable, slightly sticky and slightly plastic; common very fine and fine roots; many very fine,

fine and common medium tubular pores; common snail shell fragments; common wormcasts and termite casts; common fine threads of calcium carbonate; strongly effervescent; slightly alkaline; gradual wavy boundary.

Bk1—34 to 48 inches; pale brown (10YR 6/3) sandy clay loam, brown (10YR 5/3) moist; weak medium prismatic and moderate fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine, fine and common medium tubular pores; common snail shell fragments; contains 10 percent soft masses of calcium carbonate; common wormcasts and termite casts; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk2—48 to 57 inches; very pale brown (10YR 7/3) sandy clay loam, pale brown (10YR 6/3) moist; weak medium prismatic and weak fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine, fine and common medium tubular pores; common snail shell fragments; contains 15 percent by volume soft masses of calcium carbonate; common wormcasts and termite casts; violently effervescent; moderately alkaline; gradual wavy boundary.



Figure 30.—Profile of Sarnosa fine sandy loam, 3 to 8 percent slopes. This dark colored soil is used mainly for rangeland.

Bk3—57 to 68 inches; very pale brown (10YR 7/3) fine sandy loam, pale brown (10YR 6/3) moist; weak medium prismatic and weak fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine, fine and common medium tubular pores; common snail shell fragments; contains 1 percent rounded weakly cemented calcium carbonate fragments; contains 8 percent soft masses of calcium carbonate; common wormcasts and termite casts; violently effervescent; moderately alkaline; gradual wavy boundary.

Bk4—68 to 80 inches; very pale brown (10YR 7/3) sandy clay loam, pale brown (10YR 6/3) moist; weak medium and coarse prismatic and weak fine and medium subangular blocky structure; hard, firm, slightly sticky and slightly plastic; few very fine and fine roots; many very fine, fine and common tubular pores common snail shell fragments; contains 1 percent by volume rounded weakly cemented calcium carbonate fragments; contains 8 percent by volume soft masses of calcium carbonate; common wormcasts and termite casts; violently effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 60 inches Thickness of mollic epipedon: 10 to 20 inches

Depth to bedrock: More than 60 inches
Depth to carbonates: 15 to 40 inches

Content of rock fragments: Less than 10 percent

Ap or A horizon:

Hue—10YR Value—3 to 5 Chroma—1 or 2

Texture—fine sandy loam

Bw horizon:

Hue-7.5YR or 10YR

Value—4 to 6 Chroma—2 to 4

Texture—fine sandy loam, loam, or sandy clay loam

Bk horizon:

Hue-7.5YR or 10YR

Value—5 to 8 Chroma—2 to 4

Texture—fine sandy loam, loam, or sandy clay loam

Schattel Series

Depth class: Deep

Drainage class: Well drained

Permeability: Slow Landform: Knoll

Parent material: Clavey residuum weathered from interbedded shales and siltstone

Slope range: 2 to 5 percent

Associated soils: Campbellton, Hindes

Taxonomic class: Fine, smectitic, hyperthermic Vertic Calciustepts

Typical Pedon

Schattel clay loam, 2 to 5 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West; north 13.9 miles

on U.S. Highway 281, north 3.9 miles north on Interstate Highway 37, east 1.0 mile on Farm Road 2049, north 4.4 miles on county road and 200 feet west in rangeland; USGS Peggy, Texas topographic quadrangle; lat. 28 degrees 38 minutes 58 seconds N. and long. 98 degrees 10 minutes 59 seconds W.

- A—0 to 4 inches; grayish brown (10YR 5/2) clay loam, dark grayish brown (10YR 4/2) moist; weak fine granular and weak fine subangular blocky structure; hard, friable; common very fine and fine roots; few fine pores; few snail shell fragments; fine threads of calcium carbonate; strongly effervescent; very slightly saline; moderately alkaline; clear smooth boundary.
- Bw—4 to 13 inches; very pale brown (10YR 7/3) clay, pale brown (10YR 6/3) moist; weak medium prismatic and moderate medium subangular blocky structure; very hard, very firm; common very fine and few fine roots; few fine pores; common fine pressure surfaces; few snail shell fragments; strongly effervescent; slightly saline; moderately alkaline; clear wavy boundary.
- Bk—13 to 24 inches; very pale brown (10YR 7/3) clay, pale brown (10YR 6/3) moist; moderate fine and medium prismatic and moderate medium angular blocky structure; extremely hard, very firm; few very fine roots; common fine pores; many pressure surfaces; common snail shell fragments; few soft masses of calcium carbonate; few fine concretions of calcium carbonate; violently effervescent; slightly saline; moderately alkaline; gradual wavy boundary.
- BCky—24 to 52 inches; very pale brown (10YR 7/3) clay, pale brown (10YR 6/3) moist; strong medium angular blocky structure; extremely hard, extremely firm; contains 45 percent fragments of light gray (2.5Y 7/2) claystone of clayey texture; common soft masses of calcium carbonate; common fine concretions of calcium carbonate; common masses of gypsum crystals; violently effervescent; moderately saline; moderately alkaline; gradual wavy boundary.
- Cdyz—52 to 80 inches; light gray (2.5Y 7/2), noncemented claystone of clay texture; light gray (2.5Y 7/2) moist; massive; common soft masses of calcium carbonate; few fine concretions of calcium carbonate; many masses of gypsum crystals; violently effervescent; moderately saline; moderately alkaline.

Range in Characteristics

Solum thickness: 40 to 60 inches

Depth to weathered shale: 40 to 60 inches Content of rock fragments: Less than 15 percent

A horizon:

Hue—7.5YR or 10YR Value—3 to 6 Chroma—1 to 3 Texture—clay loam

B horizon:

Hue—5YR to 2.5Y Value—4 to 7 Chroma—1 to 6

Texture—clay loam or clay

BC horizon:

Hue—7.5YR to 5Y Value—6 to 8 Chroma—1 to 6 Texture—clay loam or clay

Cdyz horizon:

Hue-7.5YR to 5Y

Value—6 to 8 Chroma—1 to 6

Texture—weathered noncemented siltstone or claystone with texture of clay loam, silty clay, or clay

Sinton Series

Depth class: Very deep
Drainage class: Well drained
Permeability: Moderate
Landform: Flood-plain step
Parent material: Loamy alluvium
Slope range: 0 to 1 percent
Associated soils: Buchel, Odem

Taxonomic class: Fine-loamy, mixed, superactive, hyperthermic, Cumulic Haplustolls

Typical Pedon

Sinton sandy clay loam, 0 to 1 percent slopes, occasionally flooded; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south on U.S. Highway 281 1.6 miles, east and south on county road 3.5 miles, northeast on private road 1,200 feet and 200 feet northwest in rangeland; USGS George West, Texas topographic quadrangle; lat. 28 degrees 16 minutes 32 seconds N. and long. 98 degrees 4 minutes 40 seconds.

- A1—0 to 7 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark brown (10YR 2/2) moist; moderate fine granular structure; slightly hard, friable; common very fine, fine and few medium roots; common fine pores; slightly effervescent; slightly alkaline; gradual smooth boundary.
- A2—7 to 14 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate fine granular structure; slightly hard, friable; common very fine, fine and few medium roots; common fine pores; slightly effervescent; slightly alkaline; gradual smooth boundary.
- A3—14 to 25 inches; very dark gray (10YR 3/1) sandy clay loam, black (10YR 2/1) moist; moderate medium subangular blocky structure; slightly hard, friable; common very fine and fine roots; common fine pores; noneffervescent; slightly alkaline; clear smooth boundary.
- Bw1—25 to 40 inches; brown (10YR 4/3) sandy clay loam, dark brown (10YR 3/3) moist; moderate medium subangular blocky structure; slightly hard, friable; few very fine roots; few fine pores; noneffervescent; slightly alkaline; clear smooth boundary.
- Bw2—40 to 66 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; moderate medium subangular blocky structure; slightly hard, friable; few fine pores; strongly effervescent; moderately alkaline; clear smooth boundary.
- Bk—66 to 80 inches; light yellowish brown (10YR 6/4) sandy clay loam, yellowish brown (10YR 5/4) moist; weak medium subangular blocky structure; slightly hard; friable; common fine soft masses and threads of calcium carbonate; strongly effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 80 inches

Thickness of mollic epipedon: 25 to 40 inches Depth to bedrock: More than 80 inches

Content of rock fragments: Less than 1 percent

A horizon:

Hue—7.5YR or 10YR

Value—3 or 4

Chroma—1 to 3

Texture—sandy clay loam

Bw and Bk horizons:

Hue—7.5YR or 10YR

Value—4 to 8

Chroma—1 to 6

Texture—fine sandy loam, loam, sandy clay loam, or clay loam

Tiocano Series

Depth class: Very deep

Drainage class: Somewhat poorly drained

Permeability: Very slow

Landform: Closed depression on interfluve

Parent material: Clayey alluvium Slope range: 0 to 1 percent

Associated soils: Clareville, Coy, Lattas, Weesatche

Taxonomic class: Fine, smectitic, hyperthermic, Udic Haplusterts

Typical Pedon

Tiocano clay, 0 to 1 percent slopes; in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south 16.3 miles on U.S. Highway 281, then east on private farm road 0.9 mile and north 1.1 miles and 1,400 feet west in depression in pasture; USGS Midway, Texas topographic quadrangle; lat. 28 degrees 6 minutes 21 seconds N. and long. 98 degrees 5 minutes 21 seconds W.

- A—0 to 8 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, extremely firm; many fine, medium and coarse roots; common fine; common fine pressure surfaces; few fine iron-manganese concretions; common fine snail shell fragments; few seams of sandy material; few fine and medium quartz pebbles; noneffervescent; moderately alkaline; clear irregular boundary.
- Bss1—8 to 21 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, extremely firm; many fine, medium, and few coarse roots; few very fine and fine pores; common fine and medium intersecting slickensides; many pressure surfaces; few fine ironmanganese concretions; few spots of brown (10YR 5/3) loamy material; noneffervescent; neutral; gradual wavy boundary.
- Bss2—21 to 38 inches; very dark gray (10YR 3/1) clay, black (10YR 2/1) moist; moderate medium angular blocky structure; extremely hard, extremely firm; common fine and medium roots; few very fine and fine pores; common fine intersecting slickensides tilted 10 to 60 degrees; many fine pressure surfaces; few fine and medium iron-manganese concretions; few spots of brown (10YR 5/3) loamy material; noneffervescent; neutral; gradual wavy boundary.
- Bss3—38 to 50 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine and medium angular blocky structure; very hard, very firm; few fine and medium roots; few very fine and fine pores; common fine intersecting slickensides tilted 10 to 60 degrees; many pressure surfaces; few fine and medium iron-manganese concretions; few small streaks of brown (10YR 5/3) loamy material; noneffervescent; neutral; gradual wavy boundary.

Bss4—50 to 59 inches; dark gray (10YR 4/1) clay, very dark gray (10YR 3/1) moist; moderate fine and medium angular blocky structure; very hard, very firm; common fine, medium and few coarse roots; few very fine and fine pores; common fine intersecting slickensides; common pressure surfaces; few fine soft masses of ironmanganese; common spots of brown (10YR 5/3) loamy material in cracks; few fine streaks of very dark gray (10YR 3/1) soil material; few fine calcium carbonate concretions; noneffervescent; slightly alkaline; gradual wavy boundary.

Bk1—59 to 70 inches; grayish brown (10YR 5/2) clay, dark grayish brown (10YR 4/2) moist; moderate fine and medium subangular blocky and angular blocky structure; very hard, very firm; few fine, medium, and coarse roots; few very fine and fine pores; few intersecting slickensides; few fine pressure surfaces; common fine and medium concretions of calcium carbonate; strongly effervescent; moderately alkaline; clear smooth boundary.

Bk2—70 to 80 inches; light brownish gray (10YR 6/2) clay loam, grayish brown (10YR 5/2) moist; moderate fine subangular blocky structure; very hard, very firm; few coarse roots; few very fine and fine pores; few spots of grayish brown (10YR 5/2) clayey material; few soft masses of manganese; 25 percent by volume soft masses of calcium carbonate; common fine and medium concretions of calcium carbonate; violently effervescent; moderately alkaline.

Range in Characteristics

Solum thickness: More than 60 inches

Thickness of mollic epipedon: 20 to 60 inches

Depth to bedrock: More than 60 inches

Content of rock fragments: Less than 10 percent

A horizon:

Hue—10YR

Value—2 to 5

Chroma—1

Texture—clay

Bss horizon:

Hue-10YR or 2.5Y

Value—3 to 6

Chroma—1 to 3

Texture—sandy clay, silty clay, or clay

Bk horizon:

Hue-10YR or 2.5Y

Value—5 to 8

Chroma—1 to 3

Texture—clay loam, sandy clay, silty clay, or clay

Weesatche Series

Depth class: Very deep Drainage class: Well drained Permeability: Moderate

Landform: Ridge

Parent material: Loamy alluvium Slope range: 1 to 5 percent

Associated soils: Pernitas, Clareville

Taxonomic class: Fine-loamy, mixed, superactive, hyperthermic Typic Argiustolls

Typical Pedon

Weesatche sandy clay loam, 1 to 3 percent slopes (fig. 31); in Live Oak County, Texas; from the intersection of U.S. Highway 281 and U.S. Highway 59 in George West, south 16.3 miles on U.S. Highway 281, then east on private farm road 0.9 mile and north 1.2 miles and 1,400 feet west in pasture; USGS Midway, Texas topographic quadrangle; lat. 28 degrees 6 minutes 34 seconds N. and long. 98 degrees 5 minutes 17 seconds W.

- Ap—0 to 6 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 3/1) moist; moderate very fine subangular blocky structure; slightly hard, friable; many very fine, fine and few medium roots; common fine and medium tubular pores; common wormcasts; neutral, clear smooth boundary.
- A—6 to 9 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark gray (10YR 3/1) moist; moderate medium angular blocky structure; hard, friable; common very fine and fine roots; few fine and medium tubular pores; few wormcasts; slightly alkaline; clear smooth boundary.
- Bt1—9 to 16 inches; very dark grayish brown (10YR 3/2) sandy clay loam, very dark grayish brown (10YR 3/2) moist; moderate medium prismatic and strong coarse angular blocky structure; very hard, firm; few very fine and fine roots; few fine and medium tubular pores; common faint clay films on ped faces; few wormcasts; slightly alkaline; clear smooth boundary.
- Bt2—16 to 22 inches; brown (7.5YR 5/3) sandy clay loam, brown (7.5YR 4/3) moist; weak medium prismatic and strong coarse angular blocky structure; very hard, firm; few very fine and fine roots; few fine and medium tubular pores; common distinct clay films on ped faces; few wormcasts; moderately alkaline; clear smooth boundary.

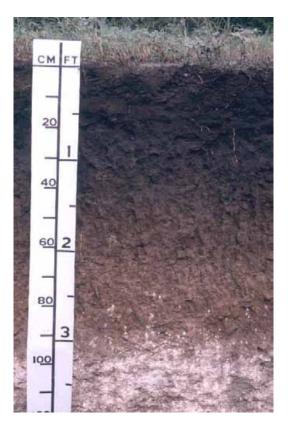


Figure 31.—Profile of Weesatche sandy clay loam, 1 to 3 percent slopes. This soil is one of the main cropland soils in the county.

- Bt3—22 to 29 inches; brown (7.5YR 5/4) sandy clay loam, brown (7.5YR 4/4) moist; weak medium prismatic and strong coarse angular blocky structure; very hard, firm; few very fine and fine roots; few fine and medium tubular pores; common distinct clay films on ped faces; few threads of calcium carbonate; few wormcasts; moderately alkaline; clear smooth boundary.
- Btk—29 to 37 inches; brown (7.5YR 5/4) clay loam, brown (7.5YR 4/4) moist; weak medium prismatic and strong medium angular blocky structure; hard, friable; few very fine and fine roots; few fine and medium tubular pores; common distinct clay films on ped faces; common fine threads of calcium carbonate; few medium soft masses of calcium carbonate; few nodules of calcium carbonate; few wormcasts; strongly effervescent; moderately alkaline; abrupt smooth boundary.
- Bk1—37 to 52 inches; yellowish brown (10YR 5/4) clay loam, dark yellowish brown (10YR 4/4) moist; weak medium prismatic and weak medium subangular blocky structure; hard, friable; few very fine and fine roots; common fine and few medium tubular pores; common medium soft masses of calcium carbonate; common fine threads of calcium carbonate; common fine nodules of calcium carbonate; few wormcasts; violently effervescent; moderately alkaline; clear smooth boundary.
- Bk2—52 to 71 inches; very pale brown (10YR 7/3) clay loam, pale brown (10YR 6/3) moist; weak medium angular blocky structure; hard, friable; few very fine and fine roots; common fine and few medium tubular pores; common soft masses of calcium carbonate; common fine threads of calcium carbonate; common fine of nodules calcium carbonate; few wormcasts; moderately alkaline; violently effervescent; diffuse boundary.
- Bk3—71 to 80 inches; pink (7.5YR 7/4) loam, light brown (7.5YR 6/4) moist; weak medium angular blocky structure; hard, friable; few very fine and fine roots; common fine and few medium tubular pores; common soft masses of calcium carbonate; common threads of calcium carbonate; common fine nodules of calcium carbonate; few wormcasts; moderately alkaline; violently effervescent.

Range in Characteristics

Solum thickness: More than 80 inches Thickness of mollic epipedon: 7 to 20 inches Depth to bedrock: More than 80 inches

Content of rock fragments: Less than 15 percent

A horizon:

Hue—7.5YR or 10YR Value—2 to 5

Chroma—1 to 3

Texture—fine sandy loam or sandy clay loam

Bt horizon:

Hue—5YR to 10YR

Value—3 to 5

Chroma—1 to 4

Texture—sandy clay loam or clay loam

Bk horizon:

Hue—5YR to 10YR

Value—3 to 7

Chroma—2 to 8

Texture—sandy clay loam or clay loam

Formation of the Soil

In this section the factors of soil formation are discussed and the surface geology of the survey area is described and related to the soils of Live Oak County.

Factors of Soil Formation

Soil is produced by the action and interaction of soil-forming factors on material deposited or accumulated by geologic processes. The characteristics of the soil at any given point are determined by the physical and mineralogical composition of the parent material, the climate under which the soil material accumulated and existed since accumulation, the plant and animal life on and in the soil, the relief or lay of the land, and the length of time these forces have acted on the soil material. One factor, or more, may be dominant in a particular area; consequently, soils differ from place to place. The interaction among the five factors is complex, continuous, and so interrelated in their effects on the soil that few generalizations can be made regarding the effect of any one factor unless conditions are specified for the other four. Each factor is discussed separately, however, and the probable effects of each are indicated.

Parent Material

Parent material is the unconsolidated mass from which a soil forms. It determines the chemical and mineral composition of the soil. The soils in Live Oak County formed in parent material derived from Tertiary and Quaternary age geologic strata. The geology of the county is discussed in more detail in the section "Surface Geology."

Climate

Live Oak County has a subtropical climate. Winters are mild and dry, and summers are hot and humid. Rainfall, evaporation, temperature, wind, and length of growing season are some of the climatic factors that directly affect soil formation through weathering, leaching of carbonates, downward movement of clay particles, reduction and movement of iron, and rate of erosion. Climate also determines the kind and amount of plant and animal life that exist on and in the soil.

Rainfall leaches minerals from the upper soil layers and deposits them in lower layers. As a result, some of the soils, such as Pernitas and Papalote, have an accumulation of calcium carbonate in the lower part.

Wind also affects the formation of soils in the county. Wind has reworked the soil material in which the Rhymes and Nusil soils formed.

Living Organisms

Plants, insects, earthworms, animals, microorganisms, other organisms, and more recently, human beings, contribute to the development of soils. Living organisms cause gains in organic matter and nitrogen in soils, gains or losses in plant nutrients, and changes in soil structure and soil porosity.

Plants play a major role in soil formation in Live Oak County. The fibrous root system of grasses contributes a large amount of organic matter to the soils. Roots of grasses, shrubs, and trees decay and leave holes and pores in the soil that serve as passageways for air and water.

Earthworms, insects, rodents, and other animals mix the soil. Worms and insects hasten the decay of organic matter and their tunnels improve soil structure and facilitate the movement of air and water throughout the soil. The decomposed organic matter adds humus to the soil and improves fertility and tilth.

People also influence soil formation. They change the makeup of the plant community by bringing in cattle to graze or change the soil structure by plowing and planting crops. Cultivation encourages runoff and erosion, thus reducing the content of organic matter and nutrients. Tillage and continuous grazing compact the clayey soils and reduce aeration, infiltration, and permeability. These actions have a definite influence on soil genesis; however, the effects may not be apparent for a long time.

Topography

Relief, or topography, influences soil development by affecting drainage, runoff, erosion, plant cover, and soil temperature.

Generally, the topography in Live Oak County ranges from nearly level to moderately sloping. Soil profile development depends on the amount of moisture and the depth to which moisture penetrates. Sloping soils take in less water and normally have a less well developed profile than nearly level soils. Many of the more sloping soils erode almost as fast as they form.

Some of the deepest soils in the county are the nearly level Buchel and Clareville soils. Soils of intermediate depth are the gently sloping Goliad and Eloso soils. The shallow soils are the very gently sloping to moderately sloping Olmos and Ecleto soils on uplands. Some of these soils have well developed horizons, others have faint or weakly developed horizons.

Relief also affects the kind and amount of vegetation on a soil. North- and East-facing slopes generally receive less direct sunlight than south- or west-facing slopes, and as a result, they are slightly cooler and lose less moisture. Vegetation is generally more dense on the north and east-facing slopes.

Time

A great length of time is required for soils to form distinct horizons. The differences in the length of time that the parent material has been in place are commonly reflected in the degree of development of soil horizons.

The soils in Live Oak County range from young to old. Young soils have very little horizon development and old soils have well developed horizons. Odem soils, for example, are young soils. They are on flood plains that are flooded and sediment is continuously added. Advanced stages of development are evident in the Nusil soils. These soils have distinct horizonation.

Some older soils have a noticeable accumulation of calcium carbonate in the lower part of the profile. Aging causes the calcium carbonate to leach from the upper horizons to lower horizons; the calcium carbonate is deposited in the form of soft masses or concretions. Pernitas, Weesatche, and Coy soils are examples of soils that have calcium carbonate in the lower horizons. Some soils have a concentration of calcium carbonate in the lower horizons that, after a great length of time, has become cemented or indurated (petrocalcic horizon). The Condido, Olmos, Parrita, and Pavelek soils are examples of soils that have a petrocalcic horizon.

Processes of Horizon Differentiation

Soils are derived from the decomposition of the mineral particles they contain and from the plant and animal remains added to them. Silicate clays, mineral particles, humus, living organisms, and water have a major influence in determining the character of the soil. Soil layers, or horizons, are formed by additions, removals, transfers, and transformations within the soil profile (25). These processes include additions or losses of

organic, mineral, and gaseous materials to the soil, transfers of material from one point to another within the soil, and physical and chemical transformation of mineral and organic materials within the soil. In most soils, more than one of these processes have been active in the development of horizons and many processes occur simultaneously.

Soil profiles are made up of a series of horizons that extend from the surface to the parent material. The parent material has been influenced little by the processes of soil formation. The horizons that make up a soil profile differ in one or more properties, such as color, texture, structure, consistence, porosity, and reaction.

Most profiles have four major horizons. These are the A, E, B, and C horizons. Some soils do not have E or B horizons.

The A horizon is the surface layer. It is the horizon that has the maximum accumulation of organic matter. Organic matter has accumulated, partially decomposed, and been incorporated into the soil. The accumulation of organic matter in soils is greatest in and above the surface layer. Many of the more stable products of organic matter decomposition remain as finely divided materials that result in darker colors, increased water-holding and cation-exchange capacities, and granulation of the soil.

The content of organic matter in the soils in Live Oak County ranges from low to medium. Buchel, Clareville, Coy, Lattas, Monteola, Odem, Sinton, and Weesatche soils have accumulated sufficient organic matter to form a dark surface layer, or A horizon.

The E horizon is the subsurface layer. It is directly below the A horizon. It is characterized by the leaching of dissolved or suspended materials. Clay particles, organic matter, and oxides of free iron have been leached from the E horizon, leaving a concentration of light-colored sand and silt particles or other resistant materials. Nusil and Rhymes soils have well-developed E horizons.

The B horizon is the subsoil. It is directly below the A or E horizons. It is the horizon that has the maximum accumulation of dissolved or suspended materials, such as clay and iron. It may also be an altered horizon that has a distinctly different structure than that of the A horizon but shows little evidence of clay translocation or accumulation.

A B horizon that has a significant amount of clay accumulation is called a Bt horizon. Clay accumulates in horizons largely because of translocation from upper to lower horizons. As water moves downward, it can carry small amounts of clay in suspension. This clay accumulates at depths penetrated by water. It accumulates in fine pores in the soil and as clay films on faces of peds. Over long periods of time, at least a few thousand years, such processes can result in distinct horizons. Clareville, Goliad, Imogene, Lacoste, Papalote and Weesatche soils are examples of soils that have strongly developed Bt horizons. Pernitas soils have a less developed Bt horizon.

A B horizon that has distinct structure or color development with little or no evidence of clay accumulation is called a Bw horizon. Plant roots and other organisms contribute to the rearrangement of soil materials into secondary aggregates. Organic residues and secretions of organisms serve as cementing agents that help stabilize structural aggregates. Soils that have appreciable amounts of clay develop structural aggregates because of drying and wetting and because of shrinking and swelling. Odem, Sarnosa, and Sinton soils are examples of soils with Bw horizons.

Some soils in Live Oak County have a high content of clay that has montmorillonite (smectite) as the dominant clay mineral. These soils shrink and develop wide, deep cracks when dry and swell and become very plastic and cohesive when wet. Because of overburden pressure, soil movement, and stress caused by wetting and drying, a platy and wedge-like structure can form in the Bss horizon. Individual structural aggregates have distinct cleavage planes and polished faces known as slickensides. When the soil is dry, soil material from the surface often falls into the wide, deep cracks or is washed into the cracks by rain. When the soil is wet, lateral pressure caused by the swelling can result in surface heaving, which eventually leads to the formation of gilgai microrelief that consists of microhighs and microlows. This gilgai microrelief is locally referred to as "hog

wallow land." Buchel, Danjer, Lattas, Monteola, and Tiocano soils have Bss horizons that have slickensides. They have gilgai microrelief.

Another important process in soil formation is the loss of components from the soil. Water can leach many soluble components, such as calcium carbonate, to the lower horizons in the profile. A horizon that has a significant accumulation of calcium carbonate is designated by the addition of the symbol "k." Annarose, Choke, and Pernitas soils are examples of soils that have accumulations of calcium carbonate in the lower horizons.

Some soils have indurated caliche layers also know as a petrocalcic horizon. The petrocalcic horizons are designated with the symbol "km". Condido, Goliad, Lacoste, Olmos, and Parrita are examples of soils with a Bkm horizon.

The C horizon is relatively unchanged by soil-forming processes, although in some places it is modified by weathering. It is generally below the B horizon.

Surface Geology

Live Oak County is located within the West Gulf Coastal Plain section of the Coastal Plain physiographic province (11). The topography in Live Oak County is generally subdued with low cuestas paralleling the outcrops of relatively erosion resistant geologic formations. The Oakville Sandstone outcrop, for example, is the substrata for a line of low rolling hills that form the Bordas Escarpment on the West Gulf Coastal Plains (13).

The Geologic Atlas of Texas, Beeville-Bay City Sheet and Crystal City-Eagle Pass Sheet, and the Geologic Map of Texas depict the geologic outcrops in Live Oak County. The oldest formations cropping out in Live Oak County are Tertiary (Eocene) age. Tertiary age outcrops become progressively younger along a traverse from northwest to southeast. The youngest geologic units in the county are Holocene alluvium along the Nueces River and its tributaries, and Holocene eolian sediment in the southwestern sector of the county (4)(21)(24).

Soil parent materials are derived from their geologic substrata; hence, soils are an indication of the underlying strata's lithology. Tertiary age clay-shale and sandstone are overlain by clayey and sandy soils, respectively. Quaternary age fluvial deposition in Live Oak County is the parent material for loamy to gravelly soils. Consequently, the General Soils Map depicts the general location and areal extent of Tertiary age formation outcrops, and of Quaternary age fluvial deposition and related stream patterns.

Tertiary Formations

Tertiary formations outcropping on the West Gulf Coastal Plain are generally in coast paralleling bands. The strike of these formations in Live Oak County is in a northeast-southwest direction. Formational dip is toward the Gulf of Mexico. Faults mapped in Tertiary formations in Live Oak County are not a major factor in soil formation and location (4)(21)(24).

Eocene age formations record ancient Gulf of Mexico transgressions and regressions over the land area. By late Eocene time, the sea had regressed and the Whitsett Formation was deposited in a continental fluvial depositional environment. The sea encroached again during Oligocene time and deposited the Frio Formation in a closed lagoonal to shallow marine environment. Miocene-Pliocene age formations indicate a subsequent gradual regression of the sea. The Catahoula, Oakville, Fleming, Goliad, and Uvalde formations in Live Oak County were deposited by ancient river systems that have been superceded by the modern Nueces River and its tributaries (3)(8).

Eocene

The upper Whitsett Formation, the oldest geologic outcrop in the county, is located on the northern and northwestern county lines. The formation in Live Oak County is composed of four members. They are, in ascending order: the Deweesville Sandstone, Dubose Clay, Calliham Sandstone, and Fashing Clay. These strata contain tuffaceous

and smectitic beds of pyroclastic ash. Campbellton clay loam, Ecleto sandy clay loam, Fashing clay loam, Laparita sandy clay loam, and Picosa loam are mapped over the Whitsett Formation in Live Oak County.

Oligocene

The Frio Formation overlies the Whitsett Formation. The Frio Formation outcrop in Live Oak County is dominantly clay and clay-shale (3). The massive, dark greenish gray, strata contain gypsum, and calcareous concretions. Esseville clay is representative of soils developed over the Frio Formation.

Miocene

The Catahoula Formation is composed of clay and fine-grained sand; and is unique because of its high content of fluvially reworked pyroclastic ash. The clay strata are smectitic and generally noncalcareous; however, some calcareous concretions are present locally. The sand beds are commonly cross-bedded and tuffaceous. Choke silty clay loam, Condido clay, Eloso clay, Pavelek clay loam, Rosenbrock clay, and Sancajo very gravelly loam have developed over the Catahoula Formation.

The outcrops of the Oakville Sandstone and Fleming Formations are not mapped separately in Live Oak County (21). Lithologically, the major difference is the predominance of sandstone or clay. The Oakville Sandstone is dominantly sandstone with lessor amounts of clay. The Fleming Formation is mostly clay with lesser quantities of sandstone. The clay and sandstone are commonly calcareous. The sandstone is medium grained, thick bedded, locally cross-bedded, and locally includes quartz and chert gravel. Monteola clay, Cotulla clay loam, Schattel clay loam, Coy clay loam, Annarose fine sandy loam, and Sarnosa fine sandy loam are mapped over these formations.

Miocene-Pliocene

The Goliad Formation lithology is diverse. It is comprised of clay, marl, limestone, sand, sandstone, caliche, and conglomerate. The clay is calcareous with calcareous concretions. The marl and limestone are poorly bedded or massive. Sand and sandstone are mostly medium to very coarse-grained quartz with some black and red chert. The sandstone is locally cross-bedded. Black chert and dark quartz granules and pebbles in a caliche matrix characterize the conglomerate. Goliad fine sandy loam, Pettus sandy clay loam, Weesatche sandy clay loam, Pernitas sandy clay loam, Parrita fine sandy loam, Lacoste fine sandy loam, and Olmos very gravelly sandy loam are mapped over the Goliad Formation.

Tertiary-Quaternary Terrace Deposits

Late Pliocene-early Pleistocene alluvium was deposited on the flood plains of now extinct paleo-drainage systems that had their headwaters in the Edwards Plateau. The larger and heavier quartz gravel was the first of the entrained sediments to be deposited as floodwaters flowed over the Coastal Plain on their way to the Gulf of Mexico. These gravel deposits have subsequently been eroded and dissected by modern drainage systems. The eroded surface remnants are now relict fluvial terraces located mostly on hill tops and mesas within the South Texas Coastal Plain (11)(21)(22)(23)(24). The Uvalde Gravel Formation is the substratum under the terraces.

Pliocene-Pleistocene

The Uvalde Gravel in Live Oak County is the substrata for remnants of a relict terrace on the north side of Choke Canyon Lake. The formation is composed of calichecemented gravel on topographically high areas. The gravel clasts are dominantly well-rounded pebbles and cobbles of chert, quartz, and igneous rocks. Maximum thickness is

about 30 feet. Mata gravelly clay loam and Hindes very gravelly sandy clay loam are mapped on the Uvalde Gravel Formation.

Quaternary Deposits

Pleistocene and Holocene fluvial sedimentation occurred in two different drainage systems. The older Pleistocene age Lissie and Beaumont formations were deposited by paleo-fluvial systems whose broad shallow channels were in constant lateral movement. Consequently, the strike and dip of these formations are oriented as the Tertiary age formations in Live Oak County. Younger fluvial sediments in Live Oak County were deposited by the modern Nueces River and its tributaries. Unlike the earlier paleo-fluvial systems, the modern Nueces River, and its tributaries are an incised system. The channels have eroded downward leaving the older flood plain sediments as substrata for relict strath terraces above and on the periphery of the modern flood plain. Consequently, the locations of these fluvial sediments are determined by channel location and stream flow direction.

Isolated Holocene age eolian sand sheets are mapped on the western and northern sides of Spring Creek, Ramirena Creek, and Lagarto Creek (4)(21)(24). The locations of these eolian sediments indicate they were derived from flood plain alluvium and fluvial terrace substrata, and deposited by prevailing southerly and southeasterly maritime winds.

Pleistocene

The Lissie Formation was laid down unconformably over the Goliad Formation. The outcrop area in Live Oak County is limited to a small area in the extreme southeastern corner of the county to the east and southwest of Lake Corpus Christi. The formation is a relatively thin eroded deposit of sand, silt, clay, and minor amounts of gravel. Papalote fine sandy loam is representative of soils mapped over the Lissie Formation.

The Beaumont Formation lies uncomformably on the Lissie Formation. Only a small area of the Beaumont Formation is mapped near Argenta in the extreme southeastern sector of county. The formation is dominantly clay with silt and sand sediments. The clay sediments were deposited as interdistributary mud, channel-fill mud, and overbank mud. Sand and silt was laid down as meanderbelt, levee, crevasse splay, and distributary deposits along old aggraded stream channels (24). Lattas clay soils are dominant over the Beaumont Formation in Live Oak County.

The fluviatile terrace substrata sediments underlie relict terraces along major streams in Live Oak County. The terraces are conspicuous along the Nueces and Atascosa Rivers (21). The terrace substrata are comprised of gravel, sand, silt, and clay; which is similar to the younger contiguous Deweyville Formation and Holocene flood plain alluvium. Clareville sandy clay loam is a typical soil developed over these fluviatile sediments.

Pleistocene-Holocene

The Deweyville Formation outcrops are on either side of Lake Corpus Christi. The sediments provide the substrata for a relict terrace about 10 feet or less above Holocene flood plain alluvium. The Deweyville Formation is composed of sand, silt, clay, and gravel. Nusil and Rhymes soils are mapped on the Deweyville Formation.

Holocene

Alluvium. These gravel, sand, clay, silt, and organic sediments are dominantly modern flood plain deposits along the Nueces River and its tributaries. Buchel clay, Odem fine sandy loam, and Sinton sandy clay loam have developed in flood plain alluvium.

Windblown Deposits. Nusil fine sand and Rhymes fine sand are mapped on eolian sediments in Live Oak County.

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Glossary

Many of the terms relating to landforms, geology, and geomorphology are defined in more detail in the "National Soil Survey Handbook" (available in local offices of the Natural Resources Conservation Service or on the Internet).

ABC soil. A soil having an A, a B, and a C horizon.

AC soil. A soil having only an A and a C horizon. Commonly, such soil formed in recent alluvium or on steep, rocky slopes.

Aeration, soil. The exchange of air in soil with air from the atmosphere. The air in a well aerated soil is similar to that in the atmosphere; the air in a poorly aerated soil is considerably higher in carbon dioxide and lower in oxygen.

Aggregate, soil. Many fine particles held in a single mass or cluster. Natural soil aggregates, such as granules, blocks, or prisms, are called peds. Clods are aggregates produced by tillage or logging.

Alkali (sodic) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Alluvial fan. The fanlike deposit of a stream where it issues from a gorge upon a plain or of a tributary stream near or at its junction with its main stream.

Alluvium. Material, such as sand, silt, or clay, deposited on land by streams.

Alpha,alpha-dipyridyl. A dye that when dissolved in 1N ammonium acetate is used to detect the presence of reduced iron (Fe II) in the soil. A positive reaction indicates a type of redoximorphic feature.

Animal unit month (AUM). The amount of forage required by one mature cow of approximately 1,000 pounds weight, with or without a calf, for 1 month.

Aquic conditions. Current soil wetness characterized by saturation, reduction, and redoximorphic features.

Argillic horizon. A subsoil horizon characterized by an accumulation of illuvial clay.
 Arroyo. The flat-floored channel of an ephemeral stream, commonly with very steep to vertical banks cut in alluvium.

Aspect. The direction in which a slope faces.

Association, soil. A group of soils or miscellaneous areas geographically associated in a characteristic repeating pattern and defined and delineated as a single map unit.

Available water capacity (available moisture capacity). The capacity of soils to hold water available for use by most plants. It is commonly defined as the difference between the amount of soil water at field moisture capacity and the amount at wilting point. It is commonly expressed as inches of water per inch of soil. The capacity, in inches, in a 60-inch profile or to a limiting layer is expressed as:

Very low	0 to 3
Low	3 to 6
Moderate	6 to 9
High	9 to 12
	more than 12

Backslope. The position that forms the steepest and generally linear, middle portion of a hill slope. In profile, backslopes are commonly bounded by a convex shoulder above and a concave footslope below.

Base saturation. The degree to which material having cation-exchange properties is saturated with exchangeable bases (sum of Ca, Mg, Na, and K), expressed as a percentage of the total cation-exchange capacity.

- **Base slope**. A geomorphic component of hills consisting of the concave to linear (perpendicular to the contour) slope that, regardless of the lateral shape, forms an apron or wedge at the bottom of a hillside dominated by colluvium and slope-wash sediments (for example, slope alluvium).
- **Bedding planes**. Fine strata, less than 5 millimeters thick, in unconsolidated alluvial, eolian, lacustrine, or marine sediment.
- **Bedding system**. A drainage system made by plowing, grading, or otherwise shaping the surface of a flat field. It consists of a series of low ridges separated by shallow, parallel dead furrows.
- **Bedrock**. The solid rock that underlies the soil and other unconsolidated material or that is exposed at the surface.
- **Bedrock-controlled topography**. A landscape where the configuration and relief of the landforms are determined or strongly influenced by the underlying bedrock.
- **Bench terrace**. A raised, level or nearly level strip of earth constructed on or nearly on a contour, supported by a barrier of rocks or similar material, and designed to make the soil suitable for tillage and to prevent accelerated erosion.
- **Bisequum**. Two sequences of soil horizons, each of which consists of an illuvial horizon and the overlying eluvial horizons.
- **Blowout**. A shallow depression from which all or most of the soil material has been removed by the wind. A blowout has a flat or irregular floor formed by a resistant layer or by an accumulation of pebbles or cobbles. In some blowouts the water table is exposed.
- **Bottom land**. The normal flood plain of a stream, subject to flooding.
- **Boulders**. Rock fragments larger than 2 feet (60 centimeters) across.
- **Breaks**. The steep and very steep broken land at the border of an upland summit that is dissected by ravines.
- **Brush management**. Use of mechanical, chemical, or biological methods to make conditions favorable for reseeding or to reduce or eliminate competition from woody vegetation and thus allow understory grasses and forbs to recover. Brush management increases forage production and thus reduces the hazard of erosion. It can improve the habitat for some species of wildlife.
- **Calcareous soil**. A soil containing enough calcium carbonate (commonly combined with magnesium carbonate) to effervesce visibly when treated with cold, dilute hydrochloric acid.
- **Caliche**. A more or less cemented deposit of calcium carbonate in soils of warm-temperate, subhumid to arid areas. Caliche occurs as soft, thin layers in the soil or as hard, thick beds directly beneath the solum, or it is exposed at the surface by erosion.
- **Canopy**. The leafy crown of trees or shrubs. (See Crown.)
- **Canyon**. A long, deep, narrow, very steep sided valley with high, precipitous walls in an area of high local relief.
- **Capillary water**. Water held as a film around soil particles and in tiny spaces between particles. Surface tension is the adhesive force that holds capillary water in the soil.
- **Catena**. A sequence, or "chain," of soils on a landscape that formed in similar kinds of parent material but have different characteristics as a result of differences in relief and drainage.
- **Cation**. An ion carrying a positive charge of electricity. The common soil cations are calcium, potassium, magnesium, sodium, and hydrogen.
- Cation-exchange capacity. The total amount of exchangeable cations that can be held by the soil, expressed in terms of milliequivalents per 100 grams of soil at neutrality (pH 7.0) or at some other stated pH value. The term, as applied to soils, is synonymous with base-exchange capacity but is more precise in meaning.

- **Channery soil material**. Soil material that has, by volume, 15 to 35 percent thin, flat fragments of sandstone, shale, slate, limestone, or schist as much as 6 inches (15 centimeters) along the longest axis. A single piece is called a channer.
- **Chemical treatment**. Control of unwanted vegetation through the use of chemicals.
- **Chiseling**. Tillage with an implement having one or more soil-penetrating points that shatter or loosen hard, compacted layers to a depth below normal plow depth.
- **Clay**. As a soil separate, the mineral soil particles less than 0.002 millimeter across. As a soil textural class, soil material that is 40 percent or more clay, less than 45 percent sand, and less than 40 percent silt.
- **Clay depletions**. Low-chroma zones having a low content of iron, manganese, and clay because of the chemical reduction of iron and manganese and the removal of iron, manganese, and clay. A type of redoximorphic depletion.
- **Clay film**. A thin coating of oriented clay on the surface of a soil aggregate or lining pores or root channels. Synonyms: clay coating, clay skin.
- **Claypan**. A slowly permeable soil horizon that contains much more clay than the horizons above it. A claypan is commonly hard when dry and plastic or stiff when wet.
- **Claystone**. An indurated rock with more than 67 percent clay-sized minerals, or an indurated clay having the texture and composition of shale but lacking its fine lamination or fissility; a massive mudstone in which clay predominates over silt; a nonfissile clay shale (9).
- **Climax plant community**. The stabilized plant community on a particular site. The plant cover reproduces itself and does not change so long as the environment remains the same
- Coarse textured soil. Sand or loamy sand.
- **Cobble (or cobblestone)**. A rounded or partly rounded fragment of rock 3 to 10 inches (7.6 to 25 centimeters) across.
- **Cobbly soil material**. Material that has 15 to 35 percent, by volume, rounded or partially rounded rock fragments 3 to 10 inches (7.6 to 25 centimeters) across. Very cobbly soil material has 35 to 60 percent of these rock fragments, and extremely cobbly soil material has more than 60 percent.
- **COLE** (coefficient of linear extensibility). See Linear extensibility.
- **Colluvium**. Soil material or rock fragments, or both, moved by creep, slide, or local wash and deposited at the base of steep slopes.
- **Complex slope**. Irregular or variable slope. Planning or establishing terraces, diversions, and other water-control structures on a complex slope is difficult.
- **Complex, soil**. A map unit of two or more kinds of soil or miscellaneous areas in such an intricate pattern or so small in area that it is not practical to map them separately at the selected scale of mapping. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas.
- **Concretions**. Cemented bodies with crude internal symmetry organized around a point, a line, or a plane. They typically take the form of concentric layers visible to the naked eye. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up concretions. If formed in place, concretions of iron oxide or manganese oxide are generally considered a type of redoximorphic concentration.
- **Conglomerate**. A coarse grained, clastic rock composed of rounded or subangular rock fragments more than 2 millimeters across. It commonly has a matrix of sand and finer textured material. Conglomerate is the consolidated equivalent of gravel.
- Conservation cropping system. Growing crops in combination with needed cultural and management practices. In a good conservation cropping system, the soil-improving crops and practices more than offset the effects of the soil-depleting crops and practices. Cropping systems are needed on all tilled soils. Soil-improving practices in a conservation cropping system include the use of rotations that contain grasses and legumes and the return of crop residue to the soil. Other practices include the use of

green manure crops of grasses and legumes, proper tillage, adequate fertilization, and weed and pest control.

- **Conservation tillage**. A tillage system that does not invert the soil and that leaves a protective amount of crop residue on the surface throughout the year.
- Consistence, soil. Refers to the degree of cohesion and adhesion of soil material and its resistance to deformation when ruptured. Consistence includes resistance of soil material to rupture and to penetration; plasticity, toughness, and stickiness of puddled soil material; and the manner in which the soil material behaves when subject to compression. Terms describing consistence are defined in the "Soil Survey Manual."
- **Contour stripcropping**. Growing crops in strips that follow the contour. Strips of grass or close-growing crops are alternated with strips of clean-tilled crops or summer fallow.
- **Control section**. The part of the soil on which classification is based. The thickness varies among different kinds of soil, but for many it is that part of the soil profile between depths of 10 inches and 40 or 80 inches.
- **Corrosion**. Soil-induced electrochemical or chemical action that dissolves or weakens concrete or uncoated steel.
- **Cover crop**. A close-growing crop grown primarily to improve and protect the soil between periods of regular crop production, or a crop grown between trees and vines in orchards and vineyards.
- **Cropping system**. Growing crops according to a planned system of rotation and management practices.
- **Crop residue management**. Returning crop residue to the soil, which helps to maintain soil structure, organic matter content, and fertility and helps to control erosion.
- **Cross-slope farming**. Deliberately conducting farming operations on sloping farmland in such a way that tillage is across the general slope.
- **Cutbanks cave (in tables)**. The walls of excavations tend to cave in or slough.
- **Decreasers**. The most heavily grazed climax range plants. Because they are the most palatable, they are the first to be destroyed by overgrazing.
- **Deferred grazing**. Postponing grazing or resting grazing land for a prescribed period. **Dense layer (in tables)**. A very firm, massive layer that has a bulk density of more than 1.8 grams per cubic centimeter. Such a layer affects the ease of digging and can affect filling and compacting.
- **Depth, soil**. Generally, the thickness of the soil over bedrock. Very deep soils are more than 60 inches deep over bedrock; deep soils, 40 to 60 inches; moderately deep, 20 to 40 inches; shallow, 10 to 20 inches; and very shallow, less than 10 inches.
- **Dip slope**. A slope of the land surface, roughly determined by and approximately conforming to the dip of the underlying bedrock.
- **Diversion (or diversion terrace)**. A ridge of earth, generally a terrace, built to protect downslope areas by diverting runoff from its natural course.
- **Divided-slope farming**. A form of field stripcropping in which crops are grown in a systematic arrangement of two strips, or bands, across the slope to reduce the water erosion hazard. One strip is in a close-growing crop that provides protection from erosion, and the other strip is in a crop that provides less protection from erosion. This practice is used where slopes are not long enough to permit a full stripcropping pattern to be used.
- Drainage class (natural). Refers to the frequency and duration of wet periods under conditions similar to those under which the soil formed. Alterations of the water regime by human activities, either through drainage or irrigation, are not a consideration unless they have significantly changed the morphology of the soil. Seven classes of natural soil drainage are recognized—excessively drained, somewhat excessively drained, well drained, moderately well drained, somewhat poorly drained, poorly drained, and very poorly drained. These classes are defined in the "Soil Survey Manual."
- **Drainage, surface**. Runoff, or surface flow of water, from an area.

- **Draw**. A small stream valley that generally is more open and has broader bottom land than a ravine or gulch.
- **Duff**. A generally firm organic layer on the surface of mineral soils. It consists of fallen plant material that is in the process of decomposition and includes everything from the litter on the surface to underlying pure humus.
- **Ecological site**. An area where climate, soil, and relief are sufficiently uniform to produce a distinct natural plant community. An ecological site is the product of all the environmental factors responsible for its development. It is typified by an association of species that differ from those on other ecological sites in kind and proportion of species or in total production.
- **Eluviation**. The movement of material in true solution or colloidal suspension from one place to another within the soil. Soil horizons that have lost material through eluviation are eluvial; those that have received material are illuvial.
- **Endosaturation**. A type of saturation of the soil in which all horizons between the upper boundary of saturation and a depth of 2 meters are saturated.
- **Eolian soil material**. Earthy parent material accumulated through wind action; commonly refers to sandy material in dunes or to loess in blankets on the surface.
- **Ephemeral stream**. A stream, or reach of a stream, that flows only in direct response to precipitation. It receives no long-continued supply from melting snow or other source, and its channel is above the water table at all times.
- **Episaturation**. A type of saturation indicating a perched water table in a soil in which saturated layers are underlain by one or more unsaturated layers within 2 meters of the surface.
- **Erosion**. The wearing away of the land surface by water, wind, ice, or other geologic agents and by such processes as gravitational creep.
- **Erosion (geologic**). Erosion caused by geologic processes acting over long geologic periods and resulting in the wearing away of mountains and the building up of such landscape features as flood plains and coastal plains. Synonym: natural erosion.
- **Erosion (accelerated)**. Erosion much more rapid than geologic erosion, mainly as a result of human or animal activities or of a catastrophe in nature, such as a fire, that exposes the surface.
- **Erosion pavement**. A layer of gravel or stones that remains on the surface after fine particles are removed by sheet or rill erosion.
- **Escarpment**. A relatively continuous and steep slope or cliff breaking the general continuity of more gently sloping land surfaces and resulting from erosion or faulting. Synonym: scarp.
- **Extrusive rock**. Igneous rock derived from deep-seated molten matter (magma) emplaced on the earth's surface.
- **Fallow**. Cropland left idle in order to restore productivity through accumulation of moisture. Summer fallow is common in regions of limited rainfall where cereal grain is grown. The soil is tilled for at least one growing season for weed control and decomposition of plant residue.
- **Fan terrace**. A relict alluvial fan, no longer a site of active deposition, incised by younger and lower alluvial surfaces.
- **Fertility, soil**. The quality that enables a soil to provide plant nutrients, in adequate amounts and in proper balance, for the growth of specified plants when light, moisture, temperature, tilth, and other growth factors are favorable.
- **Field moisture capacity**. The moisture content of a soil, expressed as a percentage of the ovendry weight, after the gravitational, or free, water has drained away; the field moisture content 2 or 3 days after a soaking rain; also called normal field capacity, normal moisture capacity, or capillary capacity.
- **Fill slope**. A sloping surface consisting of excavated soil material from a road cut. It commonly is on the downhill side of the road.
- Fine textured soil. Sandy clay, silty clay, or clay.

Firebreak. Area cleared of flammable material to stop or help control creeping or running fires. It also serves as a line from which to work and to facilitate the movement of firefighters and equipment. Designated roads also serve as firebreaks.

- **First bottom**. The normal flood plain of a stream, subject to frequent or occasional flooding.
- **Flaggy soil material**. Material that has, by volume, 15 to 35 percent flagstones. Very flaggy soil material has 35 to 60 percent flagstones, and extremely flaggy soil material has more than 60 percent flagstones.
- **Flagstone**. A thin fragment of sandstone, limestone, slate, shale, or (rarely) schist 6 to 15 inches (15 to 38 centimeters) long.
- **Flood plain**. A nearly level alluvial plain that borders a stream and is subject to flooding unless protected artificially.
- **Fluvial**. Of or pertaining to rivers; produced by river action, as a fluvial plain.
- **Foothill**. A steeply sloping upland that has relief of as much as 1,000 feet (300 meters) and fringes a mountain range or high-plateau escarpment.
- **Footslope**. The position that forms the inner, gently inclined surface at the base of a hill slope. In profile, footslopes are commonly concave. A footslope is a transition zone between upslope sites of erosion and transport (shoulders and backslopes) and downslope sites of deposition (toeslopes).
- **Forb**. Any herbaceous plant not a grass or a sedge.
- **Genesis, soil**. The mode of origin of the soil. Refers especially to the processes or soil-forming factors responsible for the formation of the solum, or true soil, from the unconsolidated parent material.
- **Gilgai**. Commonly, a succession of microlows and microhighs in nearly level areas or of microvalleys and microridges parallel with the slope. Typically, the microrelief of clayey soils that shrink and swell considerably with changes in moisture content.
- **Gleyed soil**. Soil that formed under poor drainage, resulting in the reduction of iron and other elements in the profile and in gray colors.
- **Graded stripcropping**. Growing crops in strips that grade toward a protected waterway. **Grassed waterway**. A natural or constructed waterway, typically broad and shallow, seeded to grass as protection against erosion. Conducts surface water away from cropland.
- **Gravel**. Rounded or angular fragments of rock as much as 3 inches (2 millimeters to 7.6 centimeters) across. An individual piece is a pebble.
- **Gravelly soil material**. Material that has 15 to 35 percent, by volume, rounded or angular rock fragments, not prominently flattened, as much as 3 inches (7.6 centimeters) across.
- **Green manure crop (agronomy)**. A soil-improving crop grown to be plowed under in an early stage of maturity or soon after maturity.
- Ground water. Water filling all the unblocked pores of the material below the water table.
- **Gully**. A miniature valley with steep sides cut by running water and through which water ordinarily runs only after rainfall. The distinction between a gully and a rill is one of depth. A gully generally is an obstacle to farm machinery and is too deep to be obliterated by ordinary tillage; a rill is of lesser depth and can be smoothed over by ordinary tillage.
- **Hard bedrock**. Bedrock that cannot be excavated except by blasting or by the use of special equipment that is not commonly used in construction.
- **Hardpan**. A hardened or cemented soil horizon, or layer. The soil material is sandy, loamy, or clayey and is cemented by iron oxide, silica, calcium carbonate, or other substance.
- Hard to reclaim (in tables). Reclamation is difficult after the removal of soil for construction and other uses. Revegetation and erosion control are extremely difficult.
 Head out. To form a flower head.

- **Head slope**. A geomorphic component of hills consisting of a laterally concave area of a hillside, especially at the head of a drainageway. The overland waterflow is converging.
- **High-residue crops**. Such crops as small grain and corn used for grain. If properly managed, residue from these crops can be used to control erosion until the next crop in the rotation is established. These crops return large amounts of organic matter to the soil
- **Hill**. A natural elevation of the land surface, rising as much as 1,000 feet above surrounding lowlands, commonly of limited summit area and having a well defined outline; hillsides generally have slopes of more than 15 percent. The distinction between a hill and a mountain is arbitrary and is dependent on local usage.
- **Horizon, soil**. A layer of soil, approximately parallel to the surface, having distinct characteristics produced by soil-forming processes. In the identification of soil horizons, an uppercase letter represents the major horizons. Numbers or lowercase letters that follow represent subdivisions of the major horizons. An explanation of the subdivisions is given in the "Soil Survey Manual." The major horizons of mineral soil are as follows:
 - O horizon.—An organic layer of fresh and decaying plant residue.
 - A horizon.—The mineral horizon at or near the surface in which an accumulation of humified organic matter is mixed with the mineral material. Also, a plowed surface horizon, most of which was originally part of a B horizon.
 - E horizon.—The mineral horizon in which the main feature is loss of silicate clay, iron, aluminum, or some combination of these.
 - B horizon.—The mineral horizon below an A horizon. The B horizon is in part a layer of transition from the overlying A to the underlying C horizon. The B horizon also has distinctive characteristics, such as (1) accumulation of clay, sesquioxides, humus, or a combination of these; (2) prismatic or blocky structure; (3) redder or browner colors than those in the A horizon; or (4) a combination of these.
 - C horizon.—The mineral horizon or layer, excluding indurated bedrock, that is little affected by soil-forming processes and does not have the properties typical of the overlying soil material. The material of a C horizon may be either like or unlike that in which the solum formed. If the material is known to differ from that in the solum, an Arabic numeral, commonly a 2, precedes the letter C.
 - Cr horizon.—Soft, cemented bedrock beneath the soil.
 - R layer.—Consolidated bedrock beneath the soil. The bedrock commonly underlies a C horizon, but it can be directly below an A or a B horizon.
- **Humus.** The well decomposed, more or less stable part of the organic matter in mineral soils.
- **Hydrologic soil groups**. Refers to soils grouped according to their runoff potential. The soil properties that influence this potential are those that affect the minimum rate of water infiltration on a bare soil during periods after prolonged wetting when the soil is not frozen. These properties are depth to a seasonal high water table, the infiltration rate and permeability after prolonged wetting, and depth to a very slowly permeable layer. The slope and the kind of plant cover are not considered but are separate factors in predicting runoff.
- **Igneous rock**. Rock formed by solidification from a molten or partially molten state. Major varieties include plutonic and volcanic rock. Examples are andesite, basalt, and granite.
- **Illuviation**. The movement of soil material from one horizon to another in the soil profile. Generally, material is removed from an upper horizon and deposited in a lower horizon.
- **Impervious soil**. A soil through which water, air, or roots penetrate slowly or not at all. No soil is absolutely impervious to air and water all the time.

Increasers. Species in the climax vegetation that increase in amount as the more desirable plants are reduced by close grazing. Increasers commonly are the shorter plants and the less palatable to livestock.

- **Infiltration**. The downward entry of water into the immediate surface of soil or other material, as contrasted with percolation, which is movement of water through soil layers or material.
- **Infiltration capacity**. The maximum rate at which water can infiltrate into a soil under a given set of conditions.
- **Infiltration rate**. The rate at which water penetrates the surface of the soil at any given instant, usually expressed in inches per hour. The rate can be limited by the infiltration capacity of the soil or the rate at which water is applied at the surface.
- **Intake rate**. The average rate of water entering the soil under irrigation. Most soils have a fast initial rate; the rate decreases with application time. Therefore, intake rate for design purposes is not a constant but is a variable depending on the net irrigation application. The rate of water intake, in inches per hour, is expressed as follows:

Less than 0.2	very low
	low
0.4 to 0.75	moderately low
0.75 to 1.25	moderate
1.25 to 1.75	moderately high
1.75 to 2.5	high
More than 2.5	very high

- **Interfluve**. An elevated area between two drainageways that sheds water to those drainageways.
- **Intermittent stream**. A stream, or reach of a stream, that flows for prolonged periods only when it receives ground-water discharge or long, continued contributions from melting snow or other surface and shallow subsurface sources.
- **Invaders**. On range, plants that encroach into an area and grow after the climax vegetation has been reduced by grazing. Generally, plants invade following disturbance of the surface.
- **Iron depletions**. Low-chroma zones having a low content of iron and manganese oxide because of chemical reduction and removal, but having a clay content similar to that of the adjacent matrix. A type of redoximorphic depletion.
- **Irrigation**. Application of water to soils to assist in production of crops. Methods of irrigation are:
 - Basin.—Water is applied rapidly to nearly level plains surrounded by levees or dikes. Border.—Water is applied at the upper end of a strip in which the lateral flow of water is controlled by small earth ridges called border dikes, or borders.
 - Controlled flooding.—Water is released at intervals from closely spaced field ditches and distributed uniformly over the field.
 - Corrugation.—Water is applied to small, closely spaced furrows or ditches in fields of close-growing crops or in orchards so that it flows in only one direction.
 - Drip (or trickle).—Water is applied slowly and under low pressure to the surface of the soil or into the soil through such applicators as emitters, porous tubing, or perforated pipe.
 - Furrow.—Water is applied in small ditches made by cultivation implements. Furrows are used for tree and row crops.
 - Sprinkler.—Water is sprayed over the soil surface through pipes or nozzles from a pressure system.
 - Subirrigation.—Water is applied in open ditches or tile lines until the water table is raised enough to wet the soil.
 - Wild flooding.—Water, released at high points, is allowed to flow onto an area without controlled distribution.
- **Karst (topography)**. The relief of an area underlain by limestone that dissolves in differing degrees, thus forming numerous depressions or small basins.

Knoll. A small, low, rounded hill rising above adjacent landforms.

K_{sat}. Saturated hydraulic conductivity. (See Permeability.)

Lacustrine deposit. Material deposited in lake water and exposed when the water level is lowered or the elevation of the land is raised.

Landslide. The rapid downhill movement of a mass of soil and loose rock, generally when wet or saturated. The speed and distance of movement, as well as the amount of soil and rock material, vary greatly.

Large stones (in tables). Rock fragments 3 inches (7.6 centimeters) or more across. Large stones adversely affect the specified use of the soil.

Leaching. The removal of soluble material from soil or other material by percolating water.

Linear extensibility. Refers to the change in length of an unconfined clod as moisture content is decreased from a moist to a dry state. Linear extensibility is used to determine the shrink-swell potential of soils. It is an expression of the volume change between the water content of the clod at 1/3- or 1/10-bar tension (33kPa or 10kPa tension) and oven dryness. Volume change is influenced by the amount and type of clay minerals in the soil. The volume change is the percent change for the whole soil. If it is expressed as a fraction, the resulting value is COLE, coefficient of linear extensibility.

Liquid limit. The moisture content at which the soil passes from a plastic to a liquid state.

Loam. Soil material that is 7 to 27 percent clay particles, 28 to 50 percent silt particles, and less than 52 percent sand particles.

Loess. Fine grained material, dominantly of silt-sized particles, deposited by wind. **Low-residue crops**. Such crops as corn used for silage, peas, beans, and potatoes. Residue from these crops is not adequate to control erosion until the next crop in the rotation is established. These crops return little organic matter to the soil.

Low strength. The soil is not strong enough to support loads.

Marl. An earthy, unconsolidated deposit consisting chiefly of calcium carbonate mixed with clay in approximately equal amounts.

Masses. Concentrations of substances in the soil matrix that do not have a clearly defined boundary with the surrounding soil material and cannot be removed as a discrete unit. Common compounds making up masses are calcium carbonate, gypsum or other soluble salts, iron oxide, and manganese oxide. Masses consisting of iron oxide or manganese oxide generally are considered a type of redoximorphic concentration.

Mechanical treatment. Use of mechanical equipment for seeding, brush management, and other management practices.

Medium textured soil. Very fine sandy loam, loam, silt loam, or silt.

Metamorphic rock. Rock of any origin altered in mineralogical composition, chemical composition, or structure by heat, pressure, and movement. Nearly all such rocks are crystalline.

Mineral soil. Soil that is mainly mineral material and low in organic material. Its bulk density is more than that of organic soil.

Minimum tillage. Only the tillage essential to crop production and prevention of soil damage.

Miscellaneous area. An area that has little or no natural soil and supports little or no vegetation.

Moderately coarse textured soil. Coarse sandy loam, sandy loam, or fine sandy loam. **Moderately fine textured soil**. Clay loam, sandy clay loam, or silty clay loam.

Mollic epipedon. A thick, dark, humus-rich surface horizon (or horizons) that has high base saturation and pedogenic soil structure. It may include the upper part of the subsoil.

Morphology, soil. The physical makeup of the soil, including the texture, structure, porosity, consistence, color, and other physical, mineral, and biological properties of the various horizons, and the thickness and arrangement of those horizons in the soil profile.

- **Mottling, soil.** Irregular spots of different colors that vary in number and size. Descriptive terms are as follows: abundance—few, common, and many; size—fine, medium, and coarse; and contrast—faint, distinct, and prominent. The size measurements are of the diameter along the greatest dimension. Fine indicates less than 5 millimeters (about 0.2 inch); medium, from 5 to 15 millimeters (about 0.2 to 0.6 inch); and coarse, more than 15 millimeters (about 0.6 inch).
- **Mudstone**. Sedimentary rock formed by induration of silt and clay in approximately equal amounts.
- **Munsell notation**. A designation of color by degrees of three simple variables—hue, value, and chroma. For example, a notation of 10YR 6/4 is a color with hue of 10YR, value of 6, and chroma of 4.
- **Natric horizon**. A special kind of argillic horizon that contains enough exchangeable sodium to have an adverse effect on the physical condition of the subsoil.

Neutral soil. A soil having a pH value of 6.6 to 7.3. (See Reaction, soil.)

- **Nodules**. Cemented bodies lacking visible internal structure. Calcium carbonate, iron oxide, and manganese oxide are common compounds making up nodules. If formed in place, nodules of iron oxide or manganese oxide are considered types of redoximorphic concentrations.
- **Nose slope**. A geomorphic component of hills consisting of the projecting end (laterally convex area) of a hillside. The overland waterflow is predominantly divergent.
- **Nutrient, plant**. Any element taken in by a plant essential to its growth. Plant nutrients are mainly nitrogen, phosphorus, potassium, calcium, magnesium, sulfur, iron, manganese, copper, boron, and zinc obtained from the soil and carbon, hydrogen, and oxygen obtained from the air and water.
- **Organic matter**. Plant and animal residue in the soil in various stages of decomposition. The content of organic matter in the surface layer is described as follows:

Very low	less than 0.5 percent
Low	0.5 to 1.0 percent
	1.0 to 2.0 percent
	2.0 to 4.0 percent
High	4.0 to 8.0 percent
Very high	more than 8.0 percent

- **Paleoterrace**. An erosional remnant of a terrace that retains the surface form and alluvial deposits of its origin but was not emplaced by, and commonly does not grade to, a present-day stream or drainage network.
- **Pan**. A compact, dense layer in a soil that impedes the movement of water and the growth of roots. For example, hardpan, fragipan, claypan, plowpan, and traffic pan.
- Parent material. The unconsolidated organic and mineral material in which soil forms.
- **Peat**. Unconsolidated material, largely undecomposed organic matter that has accumulated under excess moisture. (See Fibric soil material.)
- **Ped**. An individual natural soil aggregate, such as a granule, a prism, or a block.
- **Pedisediment**. A thin layer of alluvial material that mantles an erosion surface and has been transported to its present position from higher lying areas of the erosion surface.
- **Pedon**. The smallest volume that can be called "a soil." A pedon is three dimensional and large enough to permit study of all horizons. Its area ranges from about 10 to 100 square feet (1 square meter to 10 square meters), depending on the variability of the soil.
- **Percolation**. The movement of water through the soil.
- **Permeability**. The quality of the soil that enables water or air to move downward through the profile. The rate at which a saturated soil transmits water is accepted as a

measure of this quality. In soil physics, the rate is referred to as "saturated hydraulic conductivity," which is defined in the "Soil Survey Manual." In line with conventional usage in the engineering profession and with traditional usage in published soil surveys, this rate of flow continues to be expressed as "permeability." Terms describing permeability, measured in inches per hour, are as follows:

Impermeable	less than 0.0015 inch
Very slow	0.0015 to 0.06 inch
Slow	0.06 to 0.2 inch
Moderately slow	0.2 to 0.6 inch
Moderate	0.6 inch to 2.0 inches
Moderately rapid	2.0 to 6.0 inches
Rapid	6.0 to 20 inches
Verv rapid	more than 20 inches

Phase, soil. A subdivision of a soil series based on features that affect its use and management, such as slope, stoniness, and flooding.

pH value. A numerical designation of acidity and alkalinity in soil. (See Reaction, soil.)Piping (in tables). Formation of subsurface tunnels or pipelike cavities by water moving through the soil.

Pitting (in tables). Pits caused by melting around ice. They form on the soil after plant cover is removed.

Plasticity index. The numerical difference between the liquid limit and the plastic limit; the range of moisture content within which the soil remains plastic.

Plastic limit. The moisture content at which a soil changes from semisolid to plastic. **Plateau**. An extensive upland mass with relatively flat summit area that is considerably elevated (more than 100 meters) above adjacent lowlands and separated from them on one or more sides by escarpments.

Playa. The generally dry and nearly level lake plain that occupies the lowest parts of closed depressional areas, such as those on intermontane basin floors. Temporary flooding occurs primarily in response to precipitation and runoff.

Plowpan. A compacted layer formed in the soil directly below the plowed layer.

Ponding. Standing water on soils in closed depressions. Unless the soils are artificially drained, the water can be removed only by percolation or evapotranspiration.

Poorly graded. Refers to a coarse grained soil or soil material consisting mainly of particles of nearly the same size. Because there is little difference in size of the particles, density can be increased only slightly by compaction.

Potential native plant community. See Climax plant community.

Potential rooting depth (effective rooting depth). Depth to which roots could penetrate if the content of moisture in the soil were adequate. The soil has no properties restricting the penetration of roots to this depth.

Prescribed burning. Deliberately burning an area for specific management purposes, under the appropriate conditions of weather and soil moisture and at the proper time of day.

Productivity, soil. The capability of a soil for producing a specified plant or sequence of plants under specific management.

Profile, soil. A vertical section of the soil extending through all its horizons and into the parent material.

Proper grazing use. Grazing at an intensity that maintains enough cover to protect the soil and maintain or improve the quantity and quality of the desirable vegetation. This practice increases the vigor and reproduction capacity of the key plants and promotes the accumulation of litter and mulch necessary to conserve soil and water.

Rangeland. Land on which the potential natural vegetation is predominantly grasses, grasslike plants, forbs, or shrubs suitable for grazing or browsing. It includes natural grasslands, savannas, many wetlands, some deserts, tundras, and areas that support certain forb and shrub communities.

Reaction, soil. A measure of acidity or alkalinity of a soil, expressed in pH values. A soil that tests to pH 7.0 is described as precisely neutral in reaction because it is neither acid nor alkaline. The degrees of acidity or alkalinity, expressed as pH values, are:

Ultra acid	less than 3.5
Extremely acid	3.5 to 4.4
Very strongly acid	4.5 to 5.0
Strongly acid	5.1 to 5.5
Moderately acid	5.6 to 6.0
Slightly acid	6.1 to 6.5
Neutral	6.6 to 7.3
Slightly alkaline	7.4 to 7.8
Moderately alkaline	7.9 to 8.4
Strongly alkaline	8.5 to 9.0
Very strongly alkaline	9.1 and higher

- **Redoximorphic concentrations**. Nodules, concretions, soft masses, pore linings, and other features resulting from the accumulation of iron or manganese oxide. An indication of chemical reduction and oxidation resulting from saturation.
- **Redoximorphic depletions**. Low-chroma zones from which iron and manganese oxide or a combination of iron and manganese oxide and clay has been removed. These zones are indications of the chemical reduction of iron resulting from saturation.
- **Redoximorphic features**. Redoximorphic concentrations, redoximorphic depletions, reduced matrices, a positive reaction to alpha, alpha-dipyridyl, and other features indicating the chemical reduction and oxidation of iron and manganese compounds resulting from saturation.
- **Reduced matrix**. A soil matrix that has low chroma in situ because of chemically reduced iron (Fe II). The chemical reduction results from nearly continuous wetness. The matrix undergoes a change in hue or chroma within 30 minutes after exposure to air as the iron is oxidized (Fe III). A type of redoximorphic feature.
- **Regolith**. The unconsolidated mantle of weathered rock and soil material on the earth's surface; the loose earth material above the solid rock.
- **Relief**. The elevations or inequalities of a land surface, considered collectively.
- **Residuum (residual soil material)**. Unconsolidated, weathered or partly weathered mineral material that accumulated as consolidated rock disintegrated in place.
- **Rill**. A steep-sided channel resulting from accelerated erosion. A rill generally is a few inches deep and not wide enough to be an obstacle to farm machinery.
- **Road cut**. A sloping surface produced by mechanical means during road construction. It is commonly on the uphill side of the road.
- **Rock fragments**. Rock or mineral fragments having a diameter of 2 millimeters or more; for example, pebbles, cobbles, stones, and boulders.
- **Root zone**. The part of the soil that can be penetrated by plant roots.
- **Runoff**. The precipitation discharged into stream channels from an area. The water that flows off the surface of the land without sinking into the soil is called surface runoff. Water that enters the soil before reaching surface streams is called ground-water runoff or seepage flow from groundwater.
- **Saline soil**. A soil containing soluble salts in an amount that impairs growth of plants. A saline soil does not contain excess exchangeable sodium.
- **Sand**. As a soil separate, individual rock or mineral fragments from 0.05 millimeter to 2.0 millimeters across. Most sand grains consist of quartz. As a soil textural class, a soil that is 85 percent or more sand and not more than 10 percent clay.
- Sandstone. Sedimentary rock containing dominantly sand-sized particles.
- **Saturation**. Wetness characterized by zero or positive pressure of the soil water. Under conditions of saturation, the water will flow from the soil matrix into an unlined auger hole.
- **Scarification**. The act of abrading, scratching, loosening, crushing, or modifying the surface to increase water absorption or to provide a more tillable soil.

Second bottom. The first terrace above the normal flood plain (or first bottom) of a river. **Sedimentary rock**. Rock made up of particles deposited from suspension in water. The chief kinds of sedimentary rock are conglomerate, formed from gravel; sandstone, formed from sand; shale, formed from clay; and limestone, formed from soft masses of calcium carbonate. There are many intermediate types. Some wind-deposited sand is consolidated into sandstone.

Sequum. A sequence consisting of an illuvial horizon and the overlying eluvial horizon. (See Eluviation.)

Series, **soil**. A group of soils that have profiles that are almost alike, except for differences in texture of the surface layer. All the soils of a series have horizons that are similar in composition, thickness, and arrangement.

Shale. Sedimentary rock formed by the hardening of a clay deposit.

Sheet erosion. The removal of a fairly uniform layer of soil material from the land surface by the action of rainfall and surface runoff.

Shoulder. The position that forms the uppermost inclined surface near the top of a hill slope. It is a transition from backslope to summit. The surface is dominantly convex in profile and erosional in origin.

Shrink-swell (in tables). The shrinking of soil when dry and the swelling when wet. Shrinking and swelling can damage roads, dams, building foundations, and other structures. It can also damage plant roots.

Side slope. A geomorphic component of hills consisting of a laterally planar area of a hillside. The overland waterflow is predominantly parallel.

Silica. A combination of silicon and oxygen. The mineral form is called quartz.

Silica-sesquioxide ratio. The ratio of the number of molecules of silica to the number of molecules of alumina and iron oxide. The more highly weathered soils or their clay fractions in warm-temperate, humid regions, and especially those in the tropics, generally have a low ratio.

Silt. As a soil separate, individual mineral particles that range across from the upper limit of clay (0.002 millimeter) to the lower limit of very fine sand (0.05 millimeter). As a soil textural class, soil that is 80 percent or more silt and less than 12 percent clay.

Siltstone. Sedimentary rock made up of dominantly silt-sized particles.

Similar soils. Soils that share limits of diagnostic criteria, behave and perform in a similar manner, and have similar conservation needs or management requirements for the major land uses in the survey area.

Sinkhole. A depression in the landscape where limestone has been dissolved.

Slickensides. Polished and grooved surfaces produced by one mass sliding past another. In soils, slickensides may occur at the bases of slip surfaces on the steeper slopes; on faces of blocks, prisms, and columns; and in swelling clayey soils, where there is marked change in moisture content.

Slick spot. A small area of soil having a puddled, crusted, or smooth surface and an excess of exchangeable sodium. The soil generally is silty or clayey, is slippery when wet, and is low in productivity.

Slope. The inclination of the land surface from the horizontal. Percentage of slope is the vertical distance divided by horizontal distance, then multiplied by 100. Thus, a slope of 20 percent is a drop of 20 feet in 100 feet of horizontal distance. In this survey, classes for simple slopes are as follows:

Nearly level	0 to 1 percent
Very gently sloping	1 to 3 percent
Gently sloping	3 to 5 percent
Moderately sloping	5 to 8 percent
Steep	20 to 40 percent

Slow refill (in tables). The slow filling of ponds, resulting from restricted permeability in the soil.

Sodic (alkali) soil. A soil having so high a degree of alkalinity (pH 8.5 or higher) or so high a percentage of exchangeable sodium (15 percent or more of the total exchangeable bases), or both, that plant growth is restricted.

Sodicity. The degree to which a soil is affected by exchangeable sodium. Sodicity is expressed as a sodium adsorption ratio (SAR) of a saturation extract, or the ratio of Na⁺⁺ to (Ca⁺⁺ + Mg⁺⁺). The degrees of sodicity and their respective ratios are:

Slight	less than 13:1
Moderate	
Strong	more than 30:1

- **Sodium adsorption ratio (SAR)**. A measure of the amount of sodium (Na) relative to calcium (Ca) and magnesium (Mg) in the water extract from saturated soil paste. It is the ratio of the Na concentration divided by the square root of one-half of the Ca + Mg concentration.
- **Soft bedrock**. Bedrock that can be excavated with trenching machines, backhoes, small rippers, and other equipment commonly used in construction.
- **Soil**. A natural, three-dimensional body at the earth's surface. It is capable of supporting plants and has properties resulting from the integrated effect of climate and living matter acting on earthy parent material, as conditioned by relief over periods of time.
- **Soil separates**. Mineral particles less than 2 millimeters in equivalent diameter and ranging between specified size limits. The names and sizes, in millimeters, of separates recognized in the United States are as follows:

Very coarse sand	2.0 to 1.0
Coarse sand	1.0 to 0.5
Medium sand	0.5 to 0.25
Fine sand	0.25 to 0.10
Very fine sand	0.10 to 0.05
Silt	0.05 to 0.002
Clay	less than 0.002

- **Solum**. The upper part of a soil profile, above the C horizon, in which the processes of soil formation are active. The solum in soil consists of the A, E, and B horizons. Generally, the characteristics of the material in these horizons are unlike those of the material below the solum. The living roots and plant and animal activities are largely confined to the solum.
- **Stone line**. A concentration of coarse fragments in a soil. Generally, it is indicative of an old weathered surface. In a cross section, the line may be one fragment or more thick. It generally overlies material that weathered in place and is overlain by recent sediment of variable thickness.
- **Stones**. Rock fragments 10 to 24 inches (25 to 60 centimeters) across if rounded or 15 to 24 inches (38 to 60 centimeters) in length if flat.
- **Stony**. Refers to a soil containing stones in numbers that interfere with or prevent tillage.
- **Stripcropping**. Growing crops in a systematic arrangement of strips or bands that provide vegetative barriers to wind erosion and water erosion.
- Structure, soil. The arrangement of primary soil particles into compound particles or aggregates. The principal forms of soil structure are—platy (laminated), prismatic (vertical axis of aggregates longer than horizontal), columnar (prisms with rounded tops), blocky (angular or subangular), and granular. Structureless soils are either single grained (each grain by itself, as in dune sand) or massive (the particles adhering without any regular cleavage, as in many hardpans).
- **Stubble mulch**. Stubble or other crop residue left on the soil or partly worked into the soil. It protects the soil from wind erosion and water erosion after harvest, during preparation of a seedbed for the next crop, and during the early growing period of the new crop.
- **Subsoil**. Technically, the B horizon; roughly, the part of the solum below plow depth.

- **Subsoiling**. Tilling a soil below normal plow depth, ordinarily to shatter a hardpan or claypan.
- **Substratum**. The part of the soil below the solum.
- **Subsurface layer**. Any surface soil horizon (A, E, AB, or EB) below the surface layer.
- **Summer fallow**. The tillage of uncropped land during the summer to control weeds and allow storage of moisture in the soil for the growth of a later crop. A practice common in semiarid regions, where annual precipitation is not enough to produce a crop every year. Summer fallow is frequently practiced before planting winter grain.
- **Summit**. The topographically highest position of a hill slope. It has a nearly level (planar or only slightly convex) surface.
- **Surface layer**. The soil ordinarily moved in tillage, or its equivalent in uncultivated soil, ranging in depth from 4 to 10 inches (10 to 25 centimeters). Frequently designated as the "plow layer," or the "Ap horizon."
- **Surface soil**. The A, E, AB, and EB horizons, considered collectively. It includes all subdivisions of these horizons.
- **Talus**. Fragments of rock and other soil material accumulated by gravity at the foot of cliffs or steep slopes.
- **Taxadjuncts**. Soils that cannot be classified in a series recognized in the classification system. Such soils are named for a series they strongly resemble and are designated as taxadjuncts to that series because they differ in ways too small to be of consequence in interpreting their use and behavior. Soils are recognized as taxadjuncts only when one or more of their characteristics are slightly outside the range defined for the family of the series for which the soils are named.
- **Terrace**. An embankment, or ridge, constructed across sloping soils on the contour or at a slight angle to the contour. The terrace intercepts surface runoff so that water soaks into the soil or flows slowly to a prepared outlet. A terrace in a field generally is built so that the field can be farmed. A terrace intended mainly for drainage has a deep channel that is maintained in permanent sod.
- **Terrace (geologic)**. An old alluvial plain, ordinarily flat or undulating, bordering a river, a lake, or the sea.
- **Texture, soil**. The relative proportions of sand, silt, and clay particles in a mass of soil. The basic textural classes, in order of increasing proportion of fine particles, are sand, loamy sand, sandy loam, loam, silt loam, silt, sandy clay loam, clay loam, silty clay loam, sandy clay, silty clay, and clay. The sand, loamy sand, and sandy loam classes may be further divided by specifying "coarse," "fine," or "very fine."
- **Thin layer** (in tables). Otherwise suitable soil material that is too thin for the specified use.
- **Tilth, soil**. The physical condition of the soil as related to tillage, seedbed preparation, seedling emergence, and root penetration.
- **Toeslope**. The position that forms the gently inclined surface at the base of a hill slope. Toeslopes in profile are commonly gentle and linear and are constructional surfaces forming the lower part of a hill slope continuum that grades to valley or closed-depression floors.
- **Topsoil**. The upper part of the soil, which is the most favorable material for plant growth. It is ordinarily rich in organic matter and is used to topdress roadbanks, lawns, and land affected by mining.
- **Trace elements**. Chemical elements, for example, zinc, cobalt, manganese, copper, and iron, in soils in extremely small amounts. They are essential to plant growth.
- **Tuff**. A compacted deposit that is 50 percent or more volcanic ash and dust.
- **Upland**. Land at a higher elevation, in general, than the alluvial plain or stream terrace; land above the lowlands along streams.
- **Valley fill**. In glaciated regions, material deposited in stream valleys by glacial meltwater. In nonglaciated regions, alluvium deposited by heavily loaded streams.

Variegation. Refers to patterns of contrasting colors assumed to be inherited from the parent material rather than to be the result of poor drainage.

- **Water bars**. Smooth, shallow ditches or depressional areas that are excavated at an angle across a sloping road. They are used to reduce the downward velocity of water and divert it off and away from the road surface. Water bars can easily be driven over if constructed properly.
- **Weathering**. All physical and chemical changes produced in rocks or other deposits at or near the earth's surface by atmospheric agents. These changes result in disintegration and decomposition of the material.
- **Well graded**. Refers to soil material consisting of coarse grained particles that are well distributed over a wide range in size or diameter. Such soil normally can be easily increased in density and bearing properties by compaction. Contrasts with poorly graded soil.
- **Wilting point (or permanent wilting point)**. The moisture content of soil, on an ovendry basis, at which a plant (specifically a sunflower) wilts so much that it does not recover when placed in a humid, dark chamber.

Tables

NRCS Accessibility Statement

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Table 1.--Temperature and Precipitation (Recorded in the period 1971 to 2000 at Tilden, Texas)

	 Temperature (Degrees F)		 Precipitation (Inches)							
	 	 	 	2 years will		 Average number of		2 years	Average number of days with	
	Average daily maximum 	daily		Maximum temperature higher than	Minimum temperature lower than	growing	owing Average egree		More	
January	 65.8	40.7	53.3	 87	21	180	1.15	0.31	2.02	1 2
February	 70.6	44.8	57.7	92	24	 252	1.27	0.31	2.11	2
March	78.4	52.1	65.3	 97	l 29	 474	1.35	0.31	2.34	2
April	84.3	 58.6	71.4	101	 38	 634	1.95	0.40	3.46	3
Мау	90.0	 66.7	78.3	104	 51	 896	3.10	0.74	5.32	4
June	95.3	71.4	83.3	 105	l 60	 988 	 3.17	0.65	 6.05	4
July	98.1	 72.9	85.5	 106	 65	 1 , 086	1.51	0.20	2.28	2
August	98.3	72.5	85.4	 105	 66	 1 , 094	2.54	0.63	4.28	3
September-	93.4	 68.4	80.9	103	 49	 916	 2.76	0.97	4.42	3
October	 85.5	 59.5	72.5	 99	 38	 696	2.13	0.39	 3.79	3
November	 75.1	50.4	62.8	 93	 28	 388	1.30	0.12	 2.56	2
December	 67.9	43.0	55.4	 88	 19	 218	1.20	0.19	1.80	2
Yearly:	 	 -		 	 	 	 -	 -	 -	
Average-	 83.6	 58.4	71.0	 	 	 	 	 	 	
Extreme-	113	 5.0		 108	 17			 	 	
Total	 	 	 	 	 	 7 , 797 	 23.42 	 16.61 	 28.29 	 32

^{*}A growing degree day is a unit of heat available for plant growth. It can be calculated by adding the maximum and minimum daily temperatures, dividing the sum by 2, and subtracting the temperature below which growth is minimal for the principal crops in the area (50.0 degrees F).

Table 2.--Freeze Dates in Spring and Fall (Recorded in the period 1971 to 2000 at Tilden, Texas)

	Temperature						
Probability	24°F or lower		28°F or lower		32°F or lower		
Last freezing temperature in spring:			 		 		
1 year in 10 later than	February	16	 March	1	 March	19	
2 years in 10 later than	February	3	 February 	17	 March	10	
5 years in 10 later than	January	2	 January	21	 February	22	
First freezing temperature in fall:			 		 		
1 years in 10 earlier than	December	3	 November 	17	 November 	12	
2 years in 10 earlier than	December	17	 November 	30	 November 	18	
5 years in 10 earlier than	January	24	 December 	28	 November 	30	
			l		l		

Table 3.--Growing Season (Recorded in the period 1971 to 2000 at Tilden, Texas)

	Daily minimum temperature during growing season						
Probability	Number of days higher than 24°F	Number of days higher than 28°F 	ys Number of days higher than 32°F				
9 years in 10	312	282	 249				
8 years in 10	330	299	260				
5 years in 10	> 365	343	281				
2 years in 10	> 365	> 365	302				
1 year in 10	 > 365 	 > 365 	 313 				
	i						

Table 4.--Acreage and Proportionate Extent of the Soils

Map ymbol	Soil name	Acres	Percent
	.l		<u> </u>
nC	Annarose fine sandy loam, 2 to 5 percent slopes	26,430	3.8
cA	Buchel clay, 0 to 1 percent slopes, occasionally flooded	19,074	1 2.8
fΑ	Buchel clay, 0 to 1 percent slopes, frequently flooded	13,663	1 2.0
aВ	Campbellton clay loam, 1 to 3 percent slopes	2,696	0.4
аC	Campbellton clay loam, 3 to 5 percent slopes	277	*
еΒ	Choke silty clay loam, 1 to 3 percent slopes	13,725	1 2.0
eC	Choke silty clay loam, 3 to 5 percent slopes	652	*
kΑ	Clareville sandy clay loam, 0 to 1 percent slopes	11,188	1.6
kB	Clareville sandy clay loam, 1 to 3 percent slopes	3,063	0.4
nA	Condido clay, 0 to 2 percent slopes	3 , 893	0.6
οB	Conquista clay, 1 to 3 percent slopes	1,037	
oG	Conquista clay, 20 to 40 percent slopes	533	•
tB	Cotulla clay loam, 1 to 3 percent slopes	5 , 531	
yΑ	Coy clay loam, 0 to 1 percent slopes	5 , 817	
yВ	Coy clay loam, 1 to 3 percent slopes	4,972	
MA	Dams	263	•
nΑ	Danjer clay loam, 0 to 1 percent slopes	5,421	
nB	Danjer clay loam, 1 to 3 percent slopes	5,381	
сВ	Ecleto sandy clay loam, 1 to 3 percent slopes	198	*
sA	Eloso clay, 0 to 1 percent slopes	9,771	
sB	Eloso clay, 1 to 3 percent slopes	32 , 317	
νA	Esseville clay, 0 to 1 percent slopes	2,604	
νB	Esseville clay, 1 to 3 percent slopes	18,112	
7C	Esseville clay, 3 to 5 percent slopes	2,422	•
кC	Esseville gravelly clay, 1 to 5 percent slopes	1,947	
аC	Fashing clay loam, 2 to 5 percent slopes	1,604	
oВ	Goliad fine sandy loam, 1 to 3 percent slopes	3,863	
nD	Hindes very gravelly sandy clay loam, 3 to 8 percent slopes	1,727	
nA	Imogene fine sandy loam, 0 to 1 percent slopes	4,817	
aВ	Lacoste fine sandy loam, 0 to 3 percent slopes	4,682	
ρB	Laparita sandy clay loam, 1 to 3 percent slopes	3,709	
tΑ	Lattas clay, 0 to 1 percent slopes	9,792	
tВ	Lattas clay, 1 to 3 percent slopes	1,415	
aD	Mata gravelly clay loam, 3 to 8 percent slopes	1,673	
AC	Monteola clay, 0 to 1 percent slopes	1,211	
oВ	Monteola clay, 1 to 3 percent slopes	2,690	
ıC	Nusil fine sand, 1 to 5 percent slopes	9,205	
Ab	Odem fine sandy loam, 0 to 1 percent slopes, occasionally flooded	5,794	
nD	Olmos very gravelly sandy loam, 1 to 8 percent slopes	42,238	
aВ	Papalote loamy fine sand, 0 to 3 percent slopes	12,970	1.9
Ac	Papalote fine sandy loam, 0 to 1 percent slopes	4,613	
oВ	Papalote fine sandy loam, 1 to 3 percent slopes	12,484	
сВ	Parrita fine sandy loam, 1 to 3 percent slopes	1,066	
kΒ	Pavelek clay loam, 0 to 3 percent slopes	13,047	
kC2	Pavelek clay loam, 3 to 5 percent slopes, severely eroded	2,094	
nC	Pernitas fine sandy loam, 2 to 5 percent slopes	58,650	
nB	Pernitas sandy clay loam, 1 to 3 percent slopes	29,183	
tC	Pettus sandy clay loam, 2 to 5 percent slopes	11,100	
vC	Picosa loam, 1 to 5 percent slopes	593	
K	Pits	743	•
nC	Rhymes fine sand, 1 to 5 percent slopes	3,133	
οA	Rosenbrock clay, 0 to 1 percent slopes	7,834	
οB	Rosenbrock clay, 1 to 3 percent slopes	5,165	
rA	Rosenbrock clay, 0 to 1 percent slopes, rarely flooded	9,787	
aD D	Sancajo very gravelly loam, 1 to 8 percent slopes	4,532	
eD . C	Sarnosa fine sandy loam, 3 to 8 percent slopes	55,753	
nC	Schattel clay loam, 2 to 5 percent slopes	1,077	
tΑ	Sinton sandy clay loam, 0 to 1 percent slopes, occasionally flooded	26,998	•
κA	Sinton clay loam, 0 to 1 percent slopes, frequently flooded	4,714	
cA	Tiocano clay, 0 to 1 percent slopes	1,715	
sC	Ustarents loamy, 2 to 5 percent slopes	1,165	0.2

See footnote at end of table.

Table 4.--Acreage and Proportionate Extent of the Soils--Continued

Map symbol	Soil name	Acres	 Percent
WaB		64,521 1,871	
WeB	Weesatche sandy clay loam, 1 to 3 percent slopes Total	43,851	6.3

^{*} Less than 0.1 percent.

Table 5.--Prime Farmland

(Only the soils considered prime or important farmland are listed. Urban or built-up areas of the soils listed are not considered prime or important farmland. If a soil is prime or important farmland only under certain conditions, the conditions are specified in parentheses after the soil name.)

Map Symbol	Map unit name 	Farmland Classification			
BcA	Buchel clay, 0 to 1 percent slopes, occasionally flooded	 All areas are prime farmland			
СеВ	Choke silty clay loam, 1 to 3 percent slopes	All areas are prime farmland			
CeC	Choke silty clay loam, 3 to 5 percent slopes	All areas are prime farmland			
CkA	Clareville sandy clay loam, 0 to 1 percent slopes	All areas are prime farmland			
CkB	Clareville sandy clay loam, 1 to 3 percent slopes	All areas are prime farmland			
СуА	Coy clay loam, 0 to 1 percent slopes	All areas are prime farmland			
СуВ	Coy clay loam, 1 to 3 percent slopes	All areas are prime farmland			
DnA	Danjer clay loam, 0 to 1 percent slopes	All areas are prime farmland			
DnB	Danjer clay loam, 1 to 3 percent slopes	All areas are prime farmland			
EsA	Eloso clay, 0 to 1 percent slopes	All areas are prime farmland			
EsB	Eloso clay, 1 to 3 percent slopes	All areas are prime farmland			
LtA	Lattas clay, 0 to 1 percent slopes	All areas are prime farmland			
LtB	Lattas clay, 1 to 3 percent slopes	All areas are prime farmland			
MoA	Monteola clay, 0 to 1 percent slopes	All areas are prime farmland			
MoB	Monteola clay, 1 to 3 percent slopes	All areas are prime farmland			
RoA	Rosenbrock clay, 0 to 1 percent slopes	All areas are prime farmland			
RoB	Rosenbrock clay, 1 to 3 percent slopes	All areas are prime farmland			
RrA	Rosenbrock clay, 0 to 1 percent slopes, rarely flooded	All areas are prime farmland			
StA	$\mid \text{Sinton}$ sandy clay loam, 0 to 1 percent slopes, occasionally \mid flooded	All areas are prime farmland			
TcA	Tiocano clay, 0 to 1 percent slopes	All areas are prime farmland			
WaB	Weesatche fine sandy loam, 1 to 3 percent slopes	All areas are prime farmland			
WaC	Weesatche fine sandy loam, 3 to 5 percent slopes	All areas are prime farmland			
WeB OdA	Weesatche sandy clay loam, 1 to 3 percent slopes flooded	All areas are prime farmland			
PaB	Papalote loamy fine sand, 0 to 3 percent slopes	Prime farmland if irrigated			
PbA	Papalote fine sandy loam, 0 to 1 percent slopes	Prime farmland if irrigated			
PbB	Papalote fine sandy loam, 1 to 3 percent slopes	Prime farmland if irrigated			
PmC	Pernitas fine sandy loam, 2 to 5 percent slopes	Prime farmland if irrigated			
PnB	Pernitas sandy clay loam, 1 to 3 percent slopes	Prime farmland if irrigated			

Table 6.--Irrigated and Nonirrigated Yields by Map Unit Component

(Yields in the "N" columns are for nonirrigated areas; those in the "I" columns are for irrigated areas. Yields are those that can be expected under a high level of management. Absence of a yield indicates that the soil is not suited to the crop or the crop generally is not grown on the soil.)

Map symbol	Land capability 		Cotton lint		 Grain sorghum 		 Improved bermudagrass	
and soil name	N	 I	N	I	 N	l I	N	I
		 	Lbs	Lbs	l Bu	Bu	AUM	 AUM
AnC:	3e				30.00		3.00	
BcA: Buchel	3w		450.00		55.00	 	5.50	
BfA: Buchel	5w	 		 	 	 	5.00	
CaB: Campbellton	2e	 2e 1	350.00	800.00	40.00	100.00		
CaC: Campbellton	3e	'	300.00	600.00	35.00	80.00		
CeB: Choke	3e	 		 	40.00	 	3.00	
CeC: Choke	4e	 		 	30.00	 	3.00	
CkA:	2c	 	450.00	 	55.00	 	5.00	
CkB:	2e	 	400.00		50.00	 	5.00	
CnA: Condido	3e	 		 	35.00	 	2.50	
CoB: Conquista	4e	 			 	 	4.00	
CoG: Conquista	7e	 		 	 	 	2.00	
CtB: Cotulla	4e		250.00	800.00	35.00	80.00		
СуА:	2s		450.00	1,100.00	65.00	110.00	5.00	12.00
CyB:	2e		400.00	900.00	60.00	100.00	5.00	12.00
DAM:				 		 		
DnA: Danjer	2s		375.00	 	 55.00		4.00	
DnB: Danjer	3e	 	325.00	 	 45.00	 	3.50	

Table 6.--Irrigated and Nonirrigated Yields by Map Unit Component--Continued

Map symbol	Land capability 		 Cotton lint 		 Grain sorghum 		 Improved bermudagrass	
and soil name	N	I	N	I	 N	I	N	
	<u></u> -	 	Lbs	Lbs	l Bu	Bu	AUM	I AUM
EcB: Ecleto	 3e	 	 	 	30.00		2.50	
EsA: Eloso	2s	 	250.00	 	35.00		3.00	
EsB: Eloso	3e	 	250.00	 	30.00		2.50	
EvA: Esseville	2s	 		 	40.00	90.00	3.00	12.00
EvB: Esseville	2e		 		35.00	75.00	2.50	10.00
EvC: Esseville	3e				 		2.50	10.00
ExC: Esseville	3e				30.00		2.50	
FaC: Fashing	4e	 3e	250.00	500.00	 35.00	80.00	2.50	10.00
GoB: Goliad	 3e	 	275.00		 35.00		2.50	
HnD: Hindes	 6s	 6s		 	 			
ImA: Imogene	4s	 3s		 	25.00	60.00		
LaB: Lacoste	4e	 3e	 		25.00		2.00	4.00
LpB: Laparita	3e	 3e		 	30.00	65.00	3.00	12.00
LtA: Lattas	2s		400.00		60.00		4.00	
LtB: Lattas	3e		350.00	 	50.00		3.50	
MaD: Mata	6s	 		 	 		2.00	
MoA: Monteola	2s	 2s	400.00	1,000.00	 55.00	125.00	3.50	12.00
MoB: Monteola	 3e	 3e	350.00	800.00	 50.00	110.00	3.00	12.00
NuC: Nusil	4e	 3e					3.00	12.00
OdA: Odem	2w	 2w	400.00	 - 1,000.00	 45.00	110.00	4.00	12.00

Table 6.--Irrigated and Nonirrigated Yields by Map Unit Component--Continued

Map symbol	Land capability 		Cotton lint		 Grain sorghum 		 Improved bermudagrass	
and soil name	N	I	N	 I	N	 I	N	I
		 	Lbs	lbs	Bu	Bu	AUM	AUM
OmD:	 7s	 						
PaB: Papalote	3e	 	200.00		40.00		5.00	
PbA: Papalote	2s	 	250.00		45.00		5.50	
PbB: Papalote	2e		200.00		40.00		5.00	
PcB: Parrita	 3e				25.00		2.00	
PkB:	3e	 			30.00		2.50	
PkC2: Pavelek, severely eroded	 6e	 						
PmC:	3e	 	200.00		25.00		2.50	
PnB: Pernitas	2e	 		 	35.00	 	2.50	
PtC:	4e	 	 		25.00			
PvC: Picosa	7s	 2s					2.00	6.00
Px:	 8s	 	 					
RhC:	 6e	 4e					3.00	10.00
RoA:	2c	 	400.00		70.00		5.50	
RoB:	2e	 	350.00		65.00		5.00	
RrA: Rosenbrock	2w	 	400.00		70.00		5.50	
SaD: Sancajo	7s	 						
SeD: Sarnosa	4e	 	200.00		45.00		5.00	
ShC:	4e	 		 		 	2.00	
StA: Sinton	2w	 			70.00		6.00	

Table 6.--Irrigated and Nonirrigated Yields by Map Unit Component--Continued

Map symbol and soil name	Lai capab: 	- '	Cottor	n lint	 Grain s	sorghum	 Impro bermuda	
*****	' N	I	N	I	'	I	'	I
	! !	!! !	Lbs	Lbs	Bu	Bu	AUM	AUM
SxA: Sinton	 5w 			 	 	 	 6.00	
TcA: Tiocano	 4w	'		 	 25.00	 	 	
UsC: Ustarents	 4e 			 	 	 	 	
W: Water	 			 	 	 	 	
WaB: Weesatche	 2e 		350.00	 	50.00	 	6.00	
WaC: Weesatche	' 3e 		300.00	 	50.00	 	5.50	
WeB: Weesatche	 2e 	 	350.00	 	50.00	 	6.00	
	l	اا		l	l	l	l	l

(Only the soils that support rangeland vegetation suitable for grazing are rated.) Table 7.--Rangeland Productivity and Characteristic Plant Communities

Syear Syea	Man symbol	Ecological attack	3	aty-weight pi	7 9 9 9	Characteristic vegetation	Rangeland
16/acre 16/a	and soil name			Normal	Unfavorable	1	composition
16/acre			year	year	year		
### 1,000 1,			Lb/acre	acr	Lb/acre		Pct
Nooded withdill grass	arose	ray Sandy Loam	4,000	3,000	2,000	8 8 8 1	10
Military Structure						grass	10
Interpretation Inte						Bhodes are in) C
plains bright legrass						1	10
Parison cottontop=	_		_			pink pappusgrass	10
National Contents						ristlegrass	10
hel						ntop	υп
Miscellaneous programment						1	nι
Vine mesquite						shriibs	יח כי
Puffalograss						- 1	υLΩ
buffalograss		Bottomlan	2.000	4.000	3.000	false Rhodes grass	20
Virginia wildtye====================================							15
Southwestern bristlegrass						vine mesquite	10
Nitriginia wildtye=	_		_			stlegrass-	10
hairyseed paspalum plains bristlegrass	_		_			Virginia wildrye	ſΩ
plains bristlegrass	_		_			hairyseed paspalum	Ŋ
hell glant sanctour————————————————————————————————————						plains bristlegrass	ഗ വ
Winged elm						nabar	0 0
Miscellaneous perennial							1 C
hel			_			perennial	1 00
hel						perennial grasse	יזי (
Iniscellaneous trees	_					Shrubs	Ω
	_					trees	m
hel Clayey Bottomland 5,000 4,000 3,000 multiflower false Rhodes buffalograss	ر د د					annual forbs-	2
mesquite hwestern bristlegras inia wildrye yseed paspalum ns bristlegrass sandbur t sacaton ed elm	hel	ayey Bottomland	5,000	4,000	3,000	false Rhodes grass	20
mesquite hwestern bristlegras inia wildrye yseed paspalum ns bristlegrass sandbur ed elm ellaneous perennial ellaneous shrubs ellaneous trees r annual forbs	_		_			buffalograss	15
hwestern bristlegras inia wildrye yseed paspalum sandbur t acaton ed elm ellaneous perennial ellaneous shrubs r annual forbs							10
inia wildrye yseed paspalum ns bristlegrass t sacaton ed elm ellaneous perennial ellaneous shrubs ellaneous trees r annual forbs						tlegrass	10
ns bristlegrass sandbur						i I	и п
sandbur						i i	n u
t sacaton						iis biistiegiassi Sandbiir	n m
perennial perennial shrubs trees	-					t sacaton	7
perennial perennial shrubs trees	_		_			- 1	2
perennial shrubs trees	_		_			perennial forbs-	∞
shrubs	_		_			perennial	Ω
44						shrubs	ഗ
annual						(m
						annual	N

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

- Colombia Scott		Total dr	dry-weight pro	production		, , , , , , , , , , , , , , , , , , ,
Map symbol	Ecological site 	()	- Company	1	Characteristic Vegetation	Kangeland
מווע סכוד וומוופ		Year	year	year		Compositor
		Lb/acre	Lb/acre	Lb/acre		Pct
CaB: Campbellton	 Saline Clay Loam	3,600	2,700	1,800	Н	15
					Rhodes grass	10
					miscellaneous perennial grasses	10
					Pimore braesceme	D F
			- —			10
		_			Arizona cottontop	ι On
					buffalograss	n Un
			_		curlymesquite	വവ
i					shrubs	o LO
CaC:			— — — — — — — — — — — — — — — — — — —	0		F
Campbellton	Saline Clay Loam 	3, 600	7,000	008 T	pink pappusgrass false Rhodes grass	T T
	. —		_		laneous per	10
					bluest	10
						D C
			_		Piains lovegrass Arizona cottontop	D I S
			-		buffalograss	വ
	_	_	_			Ŋ
		_	_			LO I
0					miscellaneous shrubs	ഹ
Choke	 Grav Sandv Loam	4,000	3,000	2,000	false Rhodes grass	10
		_	_		ras	10
	_	_	_		lovegrass tridens	10
			_		U)	10
					re:	10
						0 0 5
						J L
					i) LO
	. —	- —	_		miscellaneous perennial forbs	ſΩ
			_			ιΩ
					vine mesquite	വ
Choke	 Gray Sandy Loam	4,000	3,000	2,000	thodes grass	10
					hooded windmill grass	10
					Lovegrass tridens mii tiflower false Rhodes grass-	10 10
			_		s perennial grasse	10
	_	_	_			10
	_	_	_		plains bristlegrass	10
					Arizona cottontop	IV II
					builalogiass===================================	n Lr
			_		shrubs	U LO
	_		_		- 1	ſΩ

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol	Ecological site	Total dr	dry-weight pr	production	Characteristic vedetation	Rangeland
and soil name		Favorable year	Normal Year	Unfavorable year		composition
			Lb/acre	Lb/acre		Pct
CkA: Clareville	Clay Loam	4, 000 000 000	3°,000	2,000	multiflower false Rhodes grass- bristlegrass spp	1 1 1 1 1 1 1 1 1 0 0 0 1 1 0 0 0 1
و و					pink pappusgrass	10
reville	Clay Loam	4 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3,000	2,000	multiflower false Rhodes grass- Dristlegrass spp	4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 « ط د					Pinhole bluestem	U N 4 N
dido	Shallow Ridge	000 °°	7,000	1,200	sidecats grama	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
Cob: Conquista	-					N
CoG: Conquista	1					

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

No.		Total dr	dry-weight pro	production		70 20 20 20 20 20 20 20 20 20 20 20 20 20
and soil name	+	Favorable year	Normal year	Unfavorable year		composition
		Lb/acre	Lb/acre	Lb/acre		Pct
Ctulla	 Saline Clay 	3,500	2,800	1,400	Texas bristlegrass	10 10 10 10
						∞ L N N N U
. M > 0					pimole bluescemerations of the proposation of the p	ממטר
Coy	Rolling Blackland	7,000	3,500	2,500	Texas cupgrass	1000
ā					Texas wintergrass	~ L L N N N
OOY	- Rolling Blackland	7,000	3,500	2,500	pinhole bluestem	10 10 10 10 10 10 10 10 10 10 10 10 10 1
DAM: Dam	 					

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

	000 E	Total dr	dry-weight pro	production	Characteristic vegetation	Rangeland
and soil name	ı	Favorable year	Normal	Unfavorable year		composition
		Lb/acre	Lb/acre	Lb/acre		Pct
DnA: Danjer	Rolling Blackland	4,000	3,500	3,000	plains bristlegrass	20
_		_			Arizona cottontop	10
		_			Texas cupgrass	10
_		_			miscellaneous shrubs	10
_		_			plains lovegrass	10
_		_			sideoats grama	10
		_			vine mesquite	10
_		_			nesquite	Ω
		_			grass	Ω
					perennial forbs-	ו פו
DnB:					miscellaneous perennial grasses 	ഗ
jer	Rolling Blackland	4,000	3,500	3,000	plains bristlegrass	20
_		_			Arizona cottontop	10
		_				10
_		_			miscellaneous shrubs	10
_		_			plains lovegrass	10
		_			sideoats grama	10
		_			vine mesquite	10
_		_			curlymesquite	2
		_			false Rhodes grass	ιΩ
_		_			miscellaneous perennial forbs	5
ţ					\neg	ſΩ
ECB: ECleto	Shallow	2,800	2,000	1,000	sideoats grama	20
)) (
_					COLLONICOP) F
					יי מדמבווו	0 7
					vine mesquite	01
					plains lovegrass	οο ι
_					plains bristlegrass	<u>_</u> _ L
_					Texas wintergrass	υш
_					Surlamograss	ΩL
					Cut Iyiiiesdul cerrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrrr	Ω ⊔
_					marry wederra	വഹ
_					shriihs III I	יו ני
_						חנ
		_			awnless bushsunflower	
		_			slim tridens	ı
_						

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

	Rangeland composition	Pct	110 100 100 100 100 5	N N N N N H H	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	10 10 10 10 10 10 10 10 10 10 10 10 10 1
	Characteristic vegetation			miscellaneous perennial forbs	Arizona cottontop	miscellaneous perennial grasses pinhole bluestem
production	Unfavorable Year	Lb/acre	2,000		7,000	2,000
dry-weight pr		Lb/acre	3,200		3,200	3,000
Total dr	Favorable year	Lb/acre	4,200		4,200	3,500
	Ecological site		Rolling Blackland		Rolling Blackland	Saline Clay
	Map symbol and soil name		ESA: Eloso		Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε Ε	Esseville

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

Ecological site

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

320

c c c c c c c c c c c c c c c c c c c		Total dr	dry-weight pro	production	\$ 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
and soil name		Favorable year	Normal	Unfavorable year	לומומומרת המלוני לפטפרמרוטו מומומר מלוני לפטפרמרוטוו	composition
		Lb/acre	Lb/acre	Lb/acre		Pct
Fac: Fashing	 - Shallow - -	2,500	2,000	1,500	pink pappusgrass	10 0 1 1 0 1 1 0 1 1 0 1 1 0 0 1 1 1 0 0 1 1 1 0 0 1 1 1 0 0 1
· 0.0					plains bristlegrass	10 10 23 33 25
Goliad	- Sandy Loam	2,500	4,200	3,000	false Rhodes grass	25 10 10 10 10
					curlymesquite	אאמממטר
Hindes	- Gravelly Ridge	3,000	1,800	1,000	Arizona cottontop	11 12 12 13 13 13 13 13 13 13 13 13 13 13 13 13
					ass tridens- ridens laneous shru	7 2 2 2 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

, compared to the compared to	() () () () () () () () () ()	Total dr	dry-weight pro	production		7
May symbor and soil name	1	Favorable	Normal	Unfavorable year		composition
			Lb/acre	Lb/acre		Pct
	Tight Sandy Loam	4,000	3,200	1,800	little bluestem	15 10 10
					w -	10 10 5 5
					plains lovegrasstanglehead	വവ
	Shallow Sandy Loam	3,500	2,300	1,000	silver bluestem	10 10 10 10 10 10 10 10 10 10 10 10 10 1
	Claypan Prairie	3,000 E	2,500	1,500	false Rhodes grass pink pappusgrass curlymesquite pinhole bluestem plains bristlegrass Arizona cottontop	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

odmys aeM		Total dr	dry-weight pro	production	Characteristic vegetation	Rangeland
and soil name		Favorable year	Normal	Unfavorable year		composition
		Lb/acre	Lb/acre	Lb/acre		Pct
ltA: Lattas	Blackland	4,500	4,000	3,000	false Rhodes grass	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
					pinhole bluestem	ממממ
Lattas	Blackland	4,500	4,000	3,000	Trass	11 11 11 11 11 11 11 11 11 11 11 11 11
					miscellaneous perennial forbs pinhole bluestem	מממממ
Mata	Gravelly Ridge	2,800	2,300	1,000	miscellaneous perennial grasses miscellaneous shrubs pink pappusgrass	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	. — —				1	Ω

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol	Ecological site	Total dr	dry-weight pro	production	Characteristic vegetation	Rangeland
and soil name		Favorable year	Normal	Unfavorable year		composition
		Lb/acre	Lb/acre	Lb/acre		Pct
Monteola	Rolling Blackland	4,000	3,500	2,500	Texas cupgrass miscellaneous perennial grasses pinhole bluestem	10 10 10 10
					vine mesquite buffalograss plains bristlegrass Texas wintergrass curlymesquite false Rhodes grass miscellaneous perennial forbs	100
MoB:					orbs	α
Monteola	Rolling Blackland	4,000	3,500	200	Texas cupgrass	7 7 8 8 8 7 7 7 8 8 8 8 7 7 9 8 8 8 7 7 9 8 8 8 7 7 9 8 8 8 9 9 9 9
Nusil	Sandy	2,000	4,000	2,500	miscellaneous perennial grasses brownseed paspalum	

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

Favorable Nor year ye Lb/acre Lb/
7 , 0000
2,700
7,000

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

7	composition	Pct				
+0 +0 +0 +0 +0 +0 +0 +0 +0 +0 +0 +0 +0 +	לוומו מומומו 		pinhole bluestem	brownseed paspalum	Inhole bluestem	fall witchgrass
production	Unfavorable Year	Lb/acre	1,800		1,800	1,200
dry-weight pro	Normal	Lb/acre	3,000		3,000	3 , 000
Total dr	Favorable year	Lb/acre	4,000		0 0 , 4	3,700
	-		Tight Sandy Loam		Tight Sandy Loam	Shallow Sandy Loam
[odmin reM	nap symbol and soil name		PbA: Papalote		Papalote	PcB: Parrita

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol Ecological site and soil name	Total dr Favorable	dry-weight pro	production Unfavorable	Characteristic vegetation	Rangeland
	year	year	year 		
	Lb/acre	Lb/acre	Lb/acre		Pct
Shallow Ridge	3,000	2,000	1,200	sideoats grama	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
severely eroded Shallow Ridge	3,000	2,000	1,200	Arizona cottontop	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
Gray Sandy Loam	7,500	3,500	2,500	multiflower false Rhodes grass- hooded windmill grass lovegrass tridens miscellaneous perennial grasses pink pappusgrass plains bristlegrass tanglehead Arizona cottontop buffalograss	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

M down	-	Total dr	dry-weight pro	production		£
map symbol and soil name	P.CCO.LCG.LCG.	Favorable year	Normal	Unfavorable year	Characteristic Vegetation	composition
		Lb/acre	Lb/acre	Lb/acre		Pct
PnB: Pernitas	- Gray Sandy Loam	4	3,500	2,500	multiflower false Rhodes grass- hooded windmill grass lovegrass tridens miscellaneous perennial grasses pink pappusgrass plains bristlegrass tanglehead	15 10 10 10 10 10 5
PtC: Pettus	- Shallow Ridge	3,200	2,700	1,500	miscellaneous perennial forbs	10 10 10 10 10 10
PvC: Picosa	- Shallow Ridge	2,500	2,000	1,000		10 115 126 137 137 137 137 137 137 137 137 137 137
					Arizona cottontop	100 100 100 100 100 100 100
Px: Pits	¦ 		!			

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

Codmiss	() () () () () () () () () ()	Total dr	dry-weight pro	production		\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\
and soil name	4	Favorable	Normal	Unfavorable	Cilaraccerracio vegeracion	composition
		Year	year	year		
		Lb/acre	Lb/acre	Lb/acre		Pct
						!
Rhymes	Sandy -	2,000	4,000	2,000	seacoast bluestem	45 15
					yellow Indiangrass	1 1
_		_			fringeleaf paspalum	Ŋ
		_			- 1	5
					perennial	பை
					miscellaneous perennial grasses switchgrass	വവ
RoA:						•
Rosenbrock	Rolling Blackland	4,200	3,200	2,000		15
					Arizona cottontop	10 10
					Texas wintergrass	100
					silver bluestem	10
_		- —			vine mesquite	10
		_				Ŋ
		_			- 1	S
						ப
					laneous shrubs	ا ب
					bristlegras	ப
					prains rovegrass	nι
					southwestern bristLegrass	J -
						- ۱
RoB:					בייייייייייייייייייייייייייייייייייייי	Ⅎ
Rosenbrock	Rolling Blackland	4,200	3,200	2,000	m	15
		_				10
		_			Texas wintergrass	10
					buffalograss	10
					silver bluestem	10
					۱ ۲	H O IC
					Middes gras	ט נט
_						ιΩ
						Ω
		_				Ω
					1 4	ហេ
					Southwestern bristlegrass	Ω -
						⊣ ←
					וניסמט כערטטומטט כערטטומטט	+

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

Rangeland	composition	Pct	10 10 10 10 10	, , , , , , , , , , , , , , , , , ,	н н	20 10 10 5 5 5 5 10	Ω Ο	20 110 110 100 5 5 5 5 5
Characteristic vegetation			sideoats grama		Texas bristlegrass	tanglehead	slim tridensmiscellaneous perennial forbs	false Rhodes grass
production	Unfavorable year	Lb/acre	2,000			1,000		2,500
dry-weight pro	Normal year	Lb/acre	3,200			1,800		3,500
Total dry	Favorable year	Lb/acre	4,200			2,700		4,500
 Ecological site			Rolling Blackland			Shallow Ridge		Gray Sandy Loam
Map symbol	and soil name	,	krA: Rosenbrock			Sancajo	SeD:	Sarnosa

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

Map symbol	Ecological site	Total dr	dry-weight pro	production	Characteristic vegetation	Rangeland
and soil name	ı	Favorable year	Normal	Unfavorable year		composition
			Lb/acre	Lb/acre		Pct
	Sloping Clay Loam	3, 500	2,500	2,000	false Rhodes grass pinhole bluestem pink pappusgrass miscellaneous perennial grasses plains bristlegrass Arisona cottontop Arisona cottontop	15 15 10 10 5
						ממממממר
	Loamy Bottomland	7,000	0000	4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	false Rhodes grass	11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	Loamy Bottomland	7,000	0000	4 0 0	false Rhodes grass	11 10 10 10 10 10 10 10 10 10 10 10 10 1

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

, בה ה ה ה ה ה ה ה ה ה ה ה ה ה ה ה ה ה ה	composition	Pct	20 20 20 10 10	ן ו ח	-	20 0 0	10 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 5 7 10 10 10 10 10 10 10 10 10 10 10 10 10	10 10 10 10 2 3
	10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		spike lovegrass	other annual forbs		multiflower false Rhodes grass- hooded windmill grass	ederandrist stern brist oristlegras rass spp ansous shru	l f fa mil ton	tanglehead
production	Unfavorable Year	Lb/acre	3,000			3,000		3,000	
dry-weight pro	Normal	Lb/acre	4. 000	!	:	4,400		4,400	
Total di	Favorable year	Lb/acre	5,000		¦ 	2,600		5,600	
7 	1		Lakebed	!		Sandy Loam		Sandy Loam	
M cdmin	and soil name	,	Tiocano	UsC: Ustarents	W: Water	WaB: Weesatche		WaC: Weesatche	

Table 7.--Rangeland Productivity and Characteristic Plant Communities--Continued

- Comment of the comm		Total dr	Total dry-weight production	oduction	+++++++++++++++++++++++++++++++++++++++	7 7 7 7 8
and soil name	ECC1-CG1-CG1-CG1-CG1-CG1-CG1-CG1-CG1-CG1-	Favorable	Normal	Unfavorable	רמומומומרמנים אפקפרמנים וו	composition
		Year	Year	Year		
М В В ::		Lb/acre 	Lb/acre	Lb/acre 		Pct
	Clay Loam	5.800	4.400	3.000	 mn1 tiflower false Bhodes grass=	20
					hooded windmill grass	10
		_		_	Arizona cottontop	10
		_		_	tanglehead	10
	_	_		_	southwestern bristlegrass	10
	_	_		_	plains bristlegrass	10
		_		_	Pappusgrass spp	10
		_		_	beardgrass	10
	_	_		_	miscellaneous shrubs	Ŋ
	_	_		_	miscellaneous perennial forbs	m
	_	_		_	other annual forbs	2
		_		_		
		_		_		

Table 8.--Wildlife Habitat

(See text for definitions of terms used in this table. Absence of an entry indicates that no rating is applicable.)

		Potenti	al for h	abitat e	lements				tial as at for	=
Map symbol and soil name	Grain and seed crops		ceous	erous	 Shrubs 	 Wetland plants 		land	Wetland wild- life 	
AnC: Annarose	 Fair 	 Good 	 Good 		 Good 	 Poor 	 Very poor	 Fair 	 Very poor	 Good
BcA: Buchel	 Fair 	 Fair 	 Poor 		 Fair 	 Poor 	 Poor 	 Fair 	 Very poor	 Poor
BfA: Buchel	 Very poor	 Poor 	 Poor 		 Fair 	 Poor 	 Poor 	 Poor 	 Poor	 Poor
CaB: Campbellton	 Good 	 Good 	 Fair 		 Fair 	-	 Very poor	 Good 	 Very poor	 Fair
CaC: Campbellton	 Fair 	 Good 	 Fair 		 Fair 		 Very poor	 Fair 	 Very poor	 Fair
CeB: Choke	 Fair 	 Good	 Fair 		 Fair 	 Poor	 Very poor	 Fair 	 Very poor	 Fair
CeC: Choke	 Fair 	 Good	 Fair 	 	 Fair	 Poor	 Very poor	 Fair 	 Very poor	 Fair
CkA: Clareville	 Good 	 Good	 Fair 		 Good	 Poor	 Very poor	 Good 	 Very poor	 Fair
CkB: Clareville	 Good 	 Good	 Fair 		 Good 	 Poor	 Very poor	 Good 	 Very poor	 Fair
CnA: Condido	 Fair 	 Good 	 Fair 		 Fair 	 Poor 	 Very poor	 Fair 	 Very poor	 Fair
CoB: Conquista	 Poor 	 Fair 	 Fair 		 Fair 		 Very poor	 Poor 	 Very poor	 Fair
CoG: Conquista	 Very poor	 Very poor	 Fair 		 Fair 		 Very poor	 Poor 	 Very poor	 Fair
CtB: Cotulla	 Poor	 Poor	 Fair 		 Fair	 Poor	 Poor	 Poor 	 Poor	 Fair
CyA: Coy	 Good 	 Good	 Fair 		 Good		 Very poor	 Good 	 Very poor	 Fair

Table 8.--Wildlife Habitat--Continued

	 	Potentia	al for h	abitat e	lements				tial as at for	
Map symbol and soil name	seed	Grasses	ceous	erous	Ì	 Wetland plants 		land wild-		
CyB:	 Good 	 Good 	 Fair 	 	 Good 	 Poor 	 Very poor	 Good 	 Very poor	 Fair
DAM: Dam	 	 	 	i			 	 		i i
DnA: Danjer	 Good 	 Good 	 Fair 		 Fair 	 Poor 	 Poor 	 Good 	 Poor 	 Fair
DnB: Danjer	 Fair 	 Good 	 Fair 	 	 Fair 	 Poor 	 Poor 	 Fair 	 Poor 	 Fair
EcB: Ecleto	 Fair 	 Good 	 Good 		 Good 		Very poor	 Good 	 Very poor	 Good
Esa: Eloso	 Fair 	 Fair 	 Fair 		 Fair 		 Very poor	 Fair 	 Very poor	 Fair
EsB: Eloso	 Fair 	 Fair 	 Fair 		 Fair 		 Very poor	 Fair 	 Very poor	 Fair
EvA: Esseville	 Poor 	 Fair 	 Fair 		 Fair 	 Poor	 Poor 	 Fair 	 Poor	 Fair
EvB: Esseville	 Poor	 Fair	 Fair		 Fair	 Poor	 Poor	 Fair	 Poor	 Fair
EvC: Esseville	 Poor 	 Fair 	 Fair 		 Fair	 Poor	 Poor 	 Fair 	 Poor	 Fair
ExC: Esseville	 Fair	 Fair	 Fair		 Fair	 Poor	 Poor	 Fair	 Poor	 Fair
FaC: Fashing	 Fair 	 Good 	 Fair 		 Fair 		 Very poor	 Fair 	 Very poor	 Fair
GoB: Goliad	 Fair 	 Good	 Good 		 Good 		 Very poor	 Good 	 Very poor	 Good
HnD: Hindes	 Poor 	 Poor 	 Fair 		 Fair 	_	 Very poor	 Poor 	 Very poor	 Fair
ImA: Imogene	 Poor 	 Poor 	 Poor 		 Poor 		 Very poor	 Poor 	 Very poor	 Poor
LaB: Lacoste	 Poor 	 Poor 	 Fair 	 	 Poor 	_	 Very poor 	 Poor 	 Very poor	 Poor

Table 8.--Wildlife Habitat--Continued

	 	Potentia	al for h	abitat e	lements				tial as at for	
Map symbol and soil name	seed	Grasses	ceous	erous		 Wetland plants 		land wild-	Wetland wild- life 	land
LpB: Laparita	 Fair 	 Fair 	 Fair 		 Fair 		 Very poor	 Fair 	 Very poor	 Fair
LtA: Lattas	 Fair	 Good	 Fair		 Fair	 Poor	 Poor	 Fair	 Poor	 Fair
LtB: Lattas	 Fair	 Good	 Fair		 Fair	 Poor	 Poor	 Fair	 Poor	 Fair
MaD: Mata	 Poor 	 Poor 	 Fair 	 	 Fair 	 Poor	 Very poor	 Poor 	 Very poor	 Fair
MoA: Monteola	 Fair 	 Good 	 Fair 	 	 Fair 	 Poor	 Very poor	 Fair 	 Very poor	 Fair
MoB: Monteola	 Fair 	 Good 	 Fair 	 	 Fair 	 Poor 	 Very poor	 Fair 	 Very poor	 Fair
NuC:	 Fair 	 Fair 	 Good 	 	 Fair 		 Very poor	 Fair 	 Very poor	 Fair
OdA:	 Good 	 Good 	 Good 	 	 Good 		 Very poor	 Good 	 Very poor	 Good
OmD: Olmos	-	 Very poor	 Poor 		 Fair		-	 Very poor	 Very poor	 Poor
PaB: Papalote	 Good	 Good	 Good	 Poor	 Good	 Poor	 Poor	 Good	 Poor	 Good
PbA: Papalote	 Good	 Good	 Good	 Poor	 Good	 Poor	 Poor	 Good	 Poor	 Good
PbB: Papalote	 Good	 Good	 Good	 Poor	 Good	 Poor	 Poor	 Good	 Poor	 Good
PcB: Parrita	 Fair 	 Good 	 Fair 	 	 Good 	 Poor	 Very poor	 Fair 	 Very poor	 Fair
PkB: Pavelek	 Fair 	 Fair 	 Fair 		 Fair 	 Poor 	 Very poor	 Fair 	 Very poor	 Fair
PkC2: Pavelek	 Fair 	 Fair 	 Fair 	 	 Fair 	 Poor 	 Very poor 	 Fair 	 Very poor	 Fair

Table 8.--Wildlife Habitat--Continued

		Potenti	al for h	abitat e	lements				tial as at for	-
Map symbol and soil name	Grain and seed crops		ceous	erous	 Shrubs 	 Wetland plants 		land	Wetland wild- life 	_
PmC: Pernitas	 Fair 	 Good 	 Fair 	 	 Good 	 Poor	 Very poor	 Fair 	 Very poor	 Fair
PnB: Pernitas	 Good	 Good	 Fair 		 Good		 Very poor	 Good	 Very poor	 Fair
PtC: Pettus	 Fair 	 Fair 	 Fair 		 Fair		 Very poor	 Fair 	 Very poor	 Fair
PvC: Picosa	 Very poor	 Very poor	 Poor 		 Poor	 Poor	 Very poor	 Very poor	 Very poor	 Poor
Px: Pits	 Very poor	-	 Very poor		 Very poor	-	 Very poor	 Very poor	 Very poor	 Very poor
RhC: Rhymes	 Fair 	 Fair 	 Fair 		 Fair		 Very poor	 Fair 	 Very poor	 Fair
RoA: Rosenbrock	 Fair	 Good	 Fair 		 Fair	 Poor	 Very poor	 Fair 	 Very poor	 Fair
RoB: Rosenbrock	 Fair 	 Good	 Fair 		 Fair		 Very poor	 Fair 	 Very poor	 Fair
RrA: Rosenbrock	 Fair	 Good	 Fair 		 Fair		 Very poor	 Fair 	 Very poor	 Fair
SaD: Sancajo	 Very poor	 Very poor	 Poor 		 Fair	-	 Very poor	 Very poor	 Very poor	 Very poor
SeD: Sarnosa	 Fair 	 Good	 Good 		 Good	-	 Very poor	 Good 	 Very poor	 Good
ShC: Schattel	 Poor 	 Fair 	 Fair 		 Fair	_	 Very poor	 Fair 	 Very poor	 Fair
StA: Sinton	 Good 	 Good 	 Good 		 Good		 Very poor	 Good 	 Very poor	 Good
SxA: Sinton	 Very poor	 Poor 	 Fair 		 Good		 Very poor	 Poor 	 Very poor	 Fair

Table 8.--Wildlife Habitat--Continued

		Potenti	al for h	abitat e	lements			•	tial as at for	
Map symbol and soil name	Grain and seed crops		Wild herba- ceous plants	erous	 Shrubs 	 Wetland plants 		Open- land wild- life	Wetland wild- life 	Range- land wild- life
TcA: Tiocano	 - Poor 	 Fair 	 Poor 	 	 Fair 	 Poor 	 Good 	 Poor 	 Fair 	 Poor
Ustarents	- Good	Good	Good		Good	Poor	Very poor	Good	Very	Good
W: Water	 - 		 				 	 		
WaB: Weesatche	 - Good 	 Good 	 Fair 		 Fair 	 Very poor	 Very poor	 Good 	 Very poor	 Fair
WaC: Weesatche	 - Fair 	 Good 	 Fair 		 Fair 	 Very poor	 Very poor	 Fair 	 Very poor	 Fair
WeB: Weesatche	 - Good 	 Good 	 Fair 	 	 Fair 	 Very poor 	 Very poor 	 Good 	 Very poor 	 Fair

Table 9.--Camp Areas, Picnic Areas, and Playgrounds

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	 		Picnic areas		Playgrounds 	
	 			 Rating class and limiting features 		 Rating class and limiting features 	Value
AnC:	70	 Not limited		 Not limited		 Somewhat limited	
minarosc	/0					Slope	0.50
BcA:							-
Buchel	· 85 	. =	 1.00	Somewhat limited Too clayey		Somewhat limited Flooding	10.60
	i		0.50		0.45	-	0.50
				movement			
		Slow water movement	0.45 	 		Slow water movement	0.45
BfA:	1	 		 		 	
Buchel	90	Very limited	i	 Somewhat limited	i	Very limited	<u> </u>
			11.00		10.50	•	1.00
		Too clayey 	10.30	Slow water movement	0.45 	Too clayey 	0.50
		Slow water movement	0.45 	Flooding 	0.40	Slow water movement	0.45
CaB: Campbellton	1 70	 Not limited	 	 Not limited		 Not limited	
CaC:	1	 		[[1
Campbellton	70	 Not limited	İ	 Not limited	İ	Somewhat limited	İ
	1	 	 	 		Slope	0.50
CeB:	i	İ	İ		i	İ	i
Choke	· 70	Not limited		Not limited		Not limited	
CeC:	ì				i		İ
Choke	· 70 	Not limited 		Not limited 		Somewhat limited Slope	10.50
CkA:				 			
Clareville	70	Not limited		Not limited		Not limited	
CkB:	į						
Clareville	· 70	Not limited 	 	Not limited 		Not limited	1
CnA:	į	į	į		į		į
Condido	· 70 	Very limited Depth to cemented pan		Very limited Depth to cemented pan		Very limited Depth to cemented pan	11.00
			0.50	_	0.50	· •	0.50
	1	Slow water movement	0.45	Slow water movement	0.45 	Slow water movement	0.45
		movement		movement			İ
CoB: Conquista	 - 85	 Somewhat limited		 Somewhat limited		 Somewhat limited	
			0.50		10.50	•	10.50
	1	· • •	0.45		0.45		0.45
	1	movement		movement		movement	

Table 9.--Camp Areas, Picnic Areas, and Playgrounds--Continued

and soil name	Pct. Of map unit			Picnic areas		Playgrounds 	
	 	=		 Rating class and limiting features 		-	
CoG: Conquista	 85 	Slope Too clayey	 1.00 0.50 0.45	Slope Too clayey			 1.00 0.50 0.45
CtB: Cotulla	 70 	Sodium content	 1.00 0.45 			 Very limited Sodium content Slow water movement Gravel content	11.00
CyA: Coy	 80 		 0.45	 Somewhat limited Slow water movement	0.45	 Somewhat limited Slow water movement	0.45
CyB: Coy	 75 	•	 0.45	 Somewhat limited Slow water movement	10.45	 Somewhat limited Slow water movement	0.45
DAM:	1 100	 Not rated		 Not rated		 Not rated	
DnA: Danjer	 75 		 0.45	 Somewhat limited Slow water movement	0.45	 Somewhat limited Slow water movement	0.45
DnB: Danjer	 70 		 0.45	 Somewhat limited Slow water movement	'	 Somewhat limited Slow water movement	0.45
EcB: Ecleto	 85 	Depth to bedrock		 Very limited Depth to bedrock Slow water movement			11.00
EsA: Eloso	 70 		 0.50 0.45		 0.50 0.45		0.50
EsB: Eloso	 70 		 0.50 0.45		0.50		0.50
EvA: Esseville	80 81 1	Sodium content Too clayey	 1.00 0.50 0.45	Too clayey	 1.00 0.50 0.45	Too clayey	 1.00 0.50 0.45

Table 9.--Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	 		Picnic areas 		 Playgrounds 	
	 	=		 Rating class and limiting features		=	
EvB: Esseville	 80 	Sodium content Too clayey	 1.00 0.50 0.45	Too clayey		Too clayey	1.00
EvC: Esseville	 70 	Sodium content Too clayey	 1.00 0.50 0.45	Too clayey		Depth to bedrock	 1.00 0.71 0.50
ExC: Esseville	 75 	Sodium content Too clayey	 1.00 1.50 0.45	Too clayey		Gravel content	 1.00 1.00 0.50
FaC: Fashing	 75 	Depth to bedrock		 Very limited Depth to bedrock Slow water movement 		Slope 	 1.00 0.50 0.39
GoB: Goliad	 70 	 Somewhat limited Depth to cemented pan		 Somewhat limited Depth to cemented pan		 Not limited 	
HnD: Hindes	 80 	 Very limited Gravel content 		=	 1.00 	Slope	 1.00 1.00 0.08
ImA: Imogene	 		 1.00 0.45		 1.00 0.45		1 1.00
LaB: Lacoste	 70 	 Very limited Depth to cemented pan 		 Very limited Depth to cemented pan 		 Very limited Depth to cemented pan 	 1.00
LpB: Laparita	 75 	 Not limited	 	 Not limited 	 	 Not limited 	
LtA: Lattas	 - 85 		 0.50 0.45 		 0.50 0.45 		 0.50 0.45

Table 9.--Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit	 		Picnic areas		Playgrounds 	
	 			 Rating class and limiting features 			
LtB: Lattas	 75 	Too clayey	0.50	Too clayey	0.50	Too clayey	 0.50 0.45
MaD: Mata	 75 	•		 Somewhat limited Gravel content 		'	11.00
MoA: Monteola	 80 	Too clayey	0.50		0.50		 0.50 0.45
MoB: Monteola	 75 	Too clayey	0.50	Too clayey	0.50	Too clayey	 0.50 0.45
NuC: Nusil	 75 	Too sandy	11.00	·	11.00	Slow water movement	 1.00 0.39 0.12
OdA: Odem	 70		 1.00	 Not limited 	 	 Somewhat limited Flooding	10.60
OmD: Olmos	 	Depth to cemented pan	1.00 	 Very limited Depth to cemented pan Gravel content 	1.00 	Gravel content Depth to cemented pan	 1.00 1.00 1.00
PaB: Papalote	 80 	Too sandy	 0.83 0.39	-	 0.83 0.39	 Somewhat limited Too sandy	 0.83 0.39
PbA: Papalote	 70 		 0.39 	 Somewhat limited Slow water movement	 0.39 	 Somewhat limited Slow water movement	 0.39
PbB: Papalote	 70 		 0.39 	 Somewhat limited Slow water movement	 0.39 	 Somewhat limited Slow water movement	 0.39

Table 9.--Camp Areas, Picnic Areas, and Playgrounds--Continued

* *	Pct. of map unit	 		Picnic areas 		Playgrounds 	
	 			Rating class and limiting features			
PcB: Parrita	 75 			 Very limited Depth to cemented pan			 1.00
PkB: Pavelek	 70 	Depth to cemented pan Slow water	1.00 0.39	 Very limited Depth to cemented pan Slow water movement	1.00 0.39	Depth to cemented pan	 0.39
PkC2: Pavelek, severely eroded	 70 1 	Depth to bedrock Depth to cemented pan	1.00 1.00 	 	1.00 1.00 	Depth to bedrock Depth to cemented pan	
PmC: Pernitas	 70 	 Not limited 	 	 Not limited 	 	 Somewhat limited Slope	 0.50
PnB: Pernitas	 70 	 Not limited 	 	 Not limited 	 	 Not limited 	
PtC: Pettus	 75 	 Not limited 	 	 Not limited 	 	 Somewhat limited Slope Gravel content 	 0.50 0.22
PvC: Picosa	 75 	Depth to bedrock Sodium content	1.00	 Very limited Depth to bedrock Sodium content 	11.00	Depth to bedrock Sodium content	11.00
Px: Pits	 90	 Not rated 	 	 Not rated 	 	 Not rated 	
RhC: Rhymes	 75 			 Very limited Too sandy 		· •	 1.00 0.12
RoA: Rosenbrock	75 	Too clayey	 0.50 0.45 	· = =	 0.50 0.45 	·	 0.50 0.45
RoB: Rosenbrock	 70 	Too clayey	 0.50 0.45 	·	 0.50 0.45 	·	 0.50 0.45

Table 9.--Camp Areas, Picnic Areas, and Playgrounds--Continued

Map symbol and soil name	Pct. of map unit			Picnic areas		Playgrounds	
	 			 Rating class and limiting features 			
RrA: Rosenbrock	 80 81 1	Flooding Too clayey 	11.00	Slow water movement			0.50
SaD: Sancajo	 80 	-	1.00 1.00 	pan	1.00	Gravel content Depth to bedrock 	İ
SeD: Sarnosa	 80 	 Not limited 	 	 Not limited 	 	 Very limited Slope	 1.00
ShC: Schattel	 70 1	 Very limited Sodium content 		 Very limited Sodium content 			 1.00 0.50
StA: Sinton	 80 		 1.00	 Not limited 	 	 Somewhat limited Flooding	 0.60
SxA: Sinton	 80 			 Somewhat limited Flooding			1
TcA: Tiocano	 90 	Depth to saturated zone Ponding 	1.00 1.00	Ponding Depth to saturated zone	1.00 1.00 	saturated zone Ponding 	 1.00 1.00
UsC: Ustarents	 70	 	 	Too Clayey	 	 Somewhat limited	 0.50
W: Water	 100	 Not rated 	 	 Not rated 	 	 Not rated 	
WaB: Weesatche	 70	 Not limited	 	 Not limited	 	 Not limited 	
WaC: Weesatche	 70 	 Not limited 	 	 Not limited 	 	 Somewhat limited Slope	 0.50
WeB: Weesatche	 70	 Not limited 	 	 Not limited 	 	 Not limited 	

Table 10.--Paths, Trails, and Golf Course Fairways

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

and soil name	 Pct. of map unit	 	S	 Off-road motorcycle trai 	ls	 Golf course fair 	ways
	 	=				 Rating class and limiting features 	
Anc: Annarose	 70	 Not limited 	 	 Not limited 		 Not limited 	
BcA: Buchel	 85 			 Somewhat limited Too clayey 			 1.00 0.60
BfA: Buchel	 90 	Too clayey	0.50	Too clayey		 Very limited Flooding Too clayey	1.00
CaB: Campbellton	 70	 Not limited 	 	 Not limited 	 	 Not limited 	
CaC: Campbellton	 70	 Not limited		 Not limited		 Not limited	
CeB: Choke	70	 Not limited	 	 Not limited		 Not limited	
CeC: Choke	70	 Not limited		 Not limited		 Not limited	
CkA:	70	 Not limited	 	 Not limited		 Not limited	
CkB:	 70	 Not limited	 	 Not limited		 Not limited	
CnA: Condido	 70 	•	 0.50 	 Somewhat limited Too clayey 	 0.50 	pan	11.00
CoB: Conquista	 85 			 Somewhat limited Too clayey	1 1 1 0.50	 Very limited Too clayey	1 1.00
CoG: Conquista	 85 	Slope		 Somewhat limited Too clayey Slope	10.50		11.00
CtB: Cotulla	 70 	 Not limited 	 	 Not limited 		 Very limited Sodium content	1 1.00
СуА:	 80 	 Not limited 	 	 Not limited 	 	 Not limited 	

Table 10.--Paths, Trails, and Golf Course Fairways--Continued

and soil name	Pct. of map unit		S	Off-road motorcycle trai 	ls	Golf course fair 	ways
CyB:	 75	 	 	 		 	
DAM: Dam	1100	 Not rated		 Not rated		 Not rated	
DnA: Danjer	75	 Not limited		 Not limited		 Not limited	
DnB: Danjer	70	 Not limited		 Not limited		 Not limited	
EcB: Ecleto	 85 	 Not limited 	 	 Not limited 	 	 Very limited Depth to bedrock Droughty	11.00
EsA: Eloso	70 				 0.50	 Very limited Too clayey Depth to bedrock	11.00
EsB: Eloso	 70 				 0.50	 Very limited Too clayey Depth to bedrock	11.00
EvA: Esseville	 80 	 Somewhat limited Too clayey 		 Somewhat limited Too clayey 	10.50		11.00
EvB: Esseville	 80 			 Somewhat limited Too clayey 		•	11.00
EvC: Esseville	 70 		 0.50 	 Somewhat limited Too clayey 	10.50		 1.00 1.00 0.71
ExC: Esseville	 75 		 0.50 	 Somewhat limited Too clayey 	 0.50 	Too clayey	11.00
FaC: Fashing	 75 	 Not limited 	 	 Not limited 	 	 Very limited Depth to bedrock Droughty 	11.00
GoB: Goliad	 70 	 Not limited 	 	 Not limited 	 	 Somewhat limited Depth to cemented pan	10.06

Table 10.--Paths, Trails, and Golf Course Fairways--Continued

Map symbol and soil name	Pct. of map unit	 	S	Off-road motorcycle trai 	ls	 Golf course fair 	ways
				=		 Rating class and limiting features 	
HnD: Hindes	 - 80 	 Not limited 		 Not limited 		Carbonate content	 1.00 1.00 0.47
ImA: Imogene	 75 	 Not limited 		 Not limited 		•	1.00
LaB: Lacoste	 - 70 	 Not limited - - -		 Not limited 		 Very limited Depth to cemented pan Droughty Depth to bedrock	11.00
LpB: Laparita	 - 75	 Not limited 	 	 Not limited 	 	 Not limited 	
LtA: Lattas	 - 85 					-	
LtB: Lattas	 - 75 			 Somewhat limited Too clayey 		 Very limited Too clayey	11.00
MaD: Mata	 75 	 Not limited 	 	 Not limited 	 	•	 0.05 0.01
MoA: Monteola	 - 80 		 0.50	 Somewhat limited Too clayey 	 0.50	 Very limited Too clayey 	1 1.00
MoB: Monteola	 - 75 		1 10.50		 0.50	 Very limited Too clayey	
NuC: Nusil	 - 75 	 Very limited Too sandy	11.00	 Very limited Too sandy		 Somewhat limited Droughty	10.45
OdA: Odem	 - 70	 Not limited 	 	 Not limited 		 Somewhat limited Flooding	 0.60
OmD: Olmos	 - 80 	 Not limited 		 Not limited 		 Very limited Depth to cemented pan Droughty Carbonate content	 1.00
PaB: Papalote	 - 80 	 Somewhat limited Too sandy 	 0.83	 Somewhat limited Too sandy 	 0.83	 Not limited 	

Table 10.--Paths, Trails, and Golf Course Fairways--Continued

and soil name	 Pct. of map unit		S	 Off-road motorcycle trai 	.ls	 Golf course fair 	ways
	 					 Rating class and limiting features 	
PbA: Papalote	 70	 Not limited	 	 Not limited	 	 Not limited	
PbB: Papalote	70 	 Not limited 	 	 Not limited 	 	 Not limited 	
PcB: Parrita	75 	 Not limited 	 	 Not limited 	 	 Very limited Depth to cemented pan	1 1.00
	 	 	 	 -	 	Carbonate content Droughty	1.00 0.71
PkB: Pavelek	 70 	 Not limited 	 	 Not limited 	 	 Very limited Depth to cemented pan	 1.00
	 	 	 	 	 	Carbonate content Depth to bedrock	
PkC2: Pavelek, severely eroded	 70 	 Not limited 	 	 Not limited 		 Very limited Depth to bedrock Depth to cemented pan	
PmC:		 		 		· •	1.00
Pernitas	70	 Not limited 	 	 Not limited 	 	 Not limited 	
PnB: Pernitas	 70 	 Not limited 	 	 Not limited 	 	 Not limited 	
PtC: Pettus	 75 	 Not limited 	 	 Not limited 	 	· · · · · · · · · · · · · · · · · · ·	0.82
PvC: Picosa	 75 	 Not limited 	 	 Not limited 		 Very limited Depth to bedrock Droughty	 1.00 1.00 1.00
Px: Pits	90	 Not rated 	 	 Not rated 	 	 Not rated 	
RhC: Rhymes	 75 	=	 1.00	 Very limited Too sandy 		 Somewhat limited Droughty 	10.43
RoA: Rosenbrock	 75 			 Somewhat limited Too clayey 	0.50	 Very limited Too clayey	11.00
RoB: Rosenbrock	 70 			 Somewhat limited Too clayey 		 Very limited Too clayey 	1 1.00

Table 10.--Paths, Trails, and Golf Course Fairways--Continued

and soil name	 Pct. of map unit	 	Off-road motorcycle trai 	ls	Golf course fairways 		
	 	=		Rating class and limiting features		Rating class and limiting features	
RrA: Rosenbrock	 80 	 Somewhat limited Too clayey 		 Somewhat limited Too clayey 	 0.50	 Very limited Too clayey 	 1.00
SaD: Sancajo	 80 	 Not limited 	 	 Not limited 	 	 Very limited Depth to bedrock Depth to cemented pan Droughty	1.00
SeD: Sarnosa	 80	 Not limited	 	 Not limited	 	 Not limited	
ShC: Schattel	 70 	 Not limited 	 	 Not limited 	 	 Very limited Sodium content	1 1.00
StA: Sinton	 80 	 Not limited 	 	 Not limited 	 	 Somewhat limited Flooding	 0.60
SxA: Sinton	 80 	 Somewhat limited Flooding		 Somewhat limited Flooding		 Very limited Flooding	 1.00
TcA: Tiocano	 90 	Depth to saturated zone	1.00 	saturated zone	1.00 	İ	 1.00 1.00
	i i	 Too clayey 	0.50	Too clayey	0.50		1.00
UsC: Ustarents	, 70	' Not limited 		 Not limited	 	 Not limited	
W: Water	100	 Not rated 		 Not rated 	 	 Not rated	
WaB: Weesatche	 70	 Not limited 		 Not limited 	 	 Not limited	
WaC: Weesatche	 70	 Not limited 		 Not limited	 	 Not limited	
WeB: Weesatche	 70 	 Not limited 	 	 Not limited 	 	 Not limited 	
	l	l	l	<u></u>	l	I	l

Table 11.--Dwellings and Small Commercial Buildings

and soil name	Pct. of map unit	basements	ut	Dwellings with basements		Small commercia buildings	al
	 			 Rating class and limiting features 			
AnC: Annarose	 70	 Not limited		 Not limited		 	
BcA: Buchel	 85 	Flooding				 Very limited Flooding Shrink-swell	11.00
BfA: Buchel	90	Flooding		Flooding		 Very limited Flooding Shrink-swell	11.00
CaB: Campbellton	 70 					 Somewhat limited Shrink-swell	1 1 1 0.50
CaC: Campbellton	 70 			 Somewhat limited Shrink-swell		 Somewhat limited Shrink-swell	1 1 1 1 1 1 1 1 1 1
CeB: Choke	 70 	•	 0.78	 Not limited 	 	 Somewhat limited Shrink-swell	 0.78
CeC: Choke	 70 			 Somewhat limited Shrink-swell		 Somewhat limited Shrink-swell	1 1 1 1 0.50
CkA: Clareville	 70 		1 1.00			 Very limited Shrink-swell	1 1 1 1 1 1 1 1 1 1
CkB: Clareville	 70 		1 1.00	. 4	1 1.00	 Very limited Shrink-swell	1 1.00
CnA: Condido	 70 	 Very limited Shrink-swell	1 1.00	 Very limited Shrink-swell	1 1.00	 Very limited Depth to thin cemented pan	1 1.00
		Depth to thin cemented pan	0.50	Depth to thin cemented pan Depth to soft bedrock	1.00	Shrink-swell	11.00
CoB: Conquista	 85 	 Not limited 	 	 Not limited 	 	 Not limited 	
CoG: Conquista	 85 	 Very limited Slope	11.00	 Very limited Slope	1 1.00	 Very limited Slope	1 1.00

Table 11.--Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	of map	Pct. Dwellings without of basements map unit		 Dwellings with basements 		 Small commercia buildings 	ıl
		=		 Rating class and limiting features 		_	
CtB: Cotulla	 - 70	. =		 - Very limited Shrink-swell		 Very limited Shrink-swell	1 1.00
CyA: Coy	- 80	 Very limited Shrink-swell		 Very limited Shrink-swell		 Very limited Shrink-swell	11.00
CyB: Coy	 - 75 	 Very limited Shrink-swell		 Very limited Shrink-swell		 Very limited Shrink-swell	1 1.00
DAM: Dam	- 100	 Not rated 	 	 Not rated 	 	 Not rated 	
DnA: Danjer	75					 Very limited Shrink-swell	11.00
DnB: Danjer	- 70 	-				 Very limited Shrink-swell	1 1.00
EcB: Ecleto	- 85 	-		-		 Very limited Depth to soft bedrock	11.00
	İ	Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	Shrink-swell	11.00
EsA: Eloso	70	· · · · · · · · · · · · · · · · · · ·	11.00	 Somewhat limited Depth to soft bedrock		_	11.00
EsB: Eloso	- 70 	 Very limited Shrink-swell 	1.00	 Somewhat limited Depth to soft bedrock	0.46	Shrink-swell	1 1 1 1 1 1 1 1 1 1
EvA: Esseville	 - 80 	. =	 1.00 	Shrink-swell			 1.00
EvB: Esseville	 - 80 	· · · · · · · · · · · · · · · · · · ·	1 1.00	•	 1.00 0.06		1 1.00
EvC: Esseville	70	•	1 1.00			 Very limited Shrink-swell 	11.00

Table 11.--Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	basements	ut	Dwellings with basements 		Small commercial buildings 	
	 	 Rating class and limiting features 		 Rating class and limiting features 		 Rating class and limiting features 	
ExC: Esseville	 75 1	. 4	 1.00	Shrink-swell	1 1.00 10.03	•	1 1.00
FaC: Fashing	 75 	. =	1 1 1 1 1 1 1 1 1 1	 Very limited Shrink-swell	1 1.00	 Very limited Depth to soft bedrock	1 1.00
		Depth to soft bedrock	0.50	Depth to soft bedrock	1.00	•	11.00
GoB: Goliad	 70 	•	 0.50 		 0.50 0.06		1 1 0.50
HnD: Hindes	 80 		 0.16	 Somewhat limited Large stones content	0.16	ĺ	 0.50
	 	 	 	 	 	Large stones content 	0.16
ImA: Imogene	 75 		 0.50	 Somewhat limited Shrink-swell	 0.50	 Somewhat limited Shrink-swell	 0.50
LaB: Lacoste	70 		 0.50 	cemented pan	1 1.00	 Somewhat limited Depth to thin cemented pan 	1 1.00
LpB: Laparita	 75	=		 Very limited Shrink-swell		 Very limited Shrink-swell	11.00
LtA: Lattas	 85 			 Very limited Shrink-swell		 Very limited Shrink-swell	1 1.00
LtB: Lattas	 75 	· · · · · · · · · · · · · · · · · · ·				 Very limited Shrink-swell	11.00
MaD: Mata	75	 Not limited		 Not limited		 Not limited	
MoA: Monteola		 Very limited Shrink-swell				 Very limited Shrink-swell	1 1.00
MoB: Monteola				 Very limited Shrink-swell		 Very limited Shrink-swell	1 1.00

Table 11.--Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	of basements map		Dwellings with basements 		 Small commercia buildings 	ıl
	 	=				· -	
NuC:	 75 	 Not limited 	 	 Not limited 	 	 Not limited 	
OdA: Odem	 70 			 Very limited Flooding		 Very limited Flooding	11.00
OmD: Olmos	 80 	•	 0.50 	cemented pan	11.00	 Somewhat limited Depth to thin cemented pan Slope	 1.00 0.12
PaB: Papalote	 80 		 0.50	 Somewhat limited Shrink-swell	 0.50	 Somewhat limited Shrink-swell	1 1 1 1 1 1 1 1 1 1
PbA: Papalote	 70 		0.50	 Somewhat limited Shrink-swell	1 0.50	 Somewhat limited Shrink-swell	0.50
PbB: Papalote	 70 		10.50	 Somewhat limited Shrink-swell	1 1 1 0.50	 Somewhat limited Shrink-swell	10.50
PcB: Parrita	 75 	Shrink-swell	0.50 	cemented pan	11.00	 Somewhat limited Depth to thin cemented pan Shrink-swell	11.00
PkB: Pavelek	 70 	Shrink-swell	0.50 	 Very limited Depth to thin cemented pan Depth to soft bedrock Shrink-swell	11.00	 Somewhat limited Depth to thin cemented pan Shrink-swell	 1.00 0.50
PkC2: Pavelek, severely eroded	 70 	 Somewhat limited Shrink-swell Depth to thin cemented pan Depth to soft bedrock	 0.50 0.50 	bedrock Depth to thin cemented pan	 1.00 1.00 1.00 1.50	cemented pan Depth to soft bedrock	 1.00 1.00 0.50
PmC: Pernitas	 70 		10.50	 Somewhat limited Shrink-swell	10.50	 Somewhat limited Shrink-swell	10.50
PnB: Pernitas	, 70 	 Somewhat limited Shrink-swell	10.50	 Somewhat limited Shrink-swell	10.50	 Somewhat limited Shrink-swell	0.50

Table 11.--Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	Pct. of map unit	of basements		Dwellings with basements		Small commercia buildings 	ıl
	 			 Rating class and limiting features		•	Value
PtC: Pettus	 75	 Not limited		 Not limited	 	 Not limited	
PvC: Picosa	 - 75 	 Somewhat limited Depth to soft bedrock		 Very limited Depth to soft bedrock		 Somewhat limited Depth to soft bedrock	11.00
Px: Pits	 - 90 	 Not rated 	 	 Not rated 		 Not rated 	
RhC: Rhymes	 - 75 	 Not limited 	 	 Not limited 		 Not limited 	
RoA: Rosenbrock	 - 75 		1 1.00	 Very limited Shrink-swell	1 1.00	 Very limited Shrink-swell	1 1.00
RoB: Rosenbrock	 - 70 	. 4	11.00	-	1 1.00	 Very limited Shrink-swell	1 1.00
RrA: Rosenbrock	 - 80 	Flooding		Flooding		 Very limited Flooding Shrink-swell	11.00
SaD: Sancajo	 - 80 	Large stones content Depth to thin cemented pan	0.99 0.50	bedrock Depth to thin cemented pan	11.00		 1.00 1.00 0.99
SeD: Sarnosa	 - 80 	 Not limited 	 	 Not limited 	 	 Somewhat limited Slope	 0.50
ShC: Schattel	 - 70			 Very limited Shrink-swell	 1.00	 Very limited Shrink-swell	 1.00
StA: Sinton	 - 80			 Very limited Flooding		 Very limited Flooding	1 1.00
SxA: Sinton	 - 80 			 Very limited Flooding		 Very limited Flooding	11.00
TcA: Tiocano	90	Ponding Depth to saturated zone	 1.00 1.00 1.00	Depth to saturated zone		saturated zone	 1.00 1.00 1.00

Table 11.--Dwellings and Small Commercial Buildings--Continued

Map symbol and soil name	 Pct. of map unit	Dwellings without basements		 Dwellings with basements 		Small commercial buildings	
	 	 Rating class and limiting features 		 Rating class and limiting features 		Rating class and limiting features	Value
UsC: Ustarents	 70 	•		 Somewhat limited Shrink-swell	 0.50	 Somewhat limited Shrink-swell	 0.50
W: Water	1100	 Not rated 	 	 Not rated 	 	 Not rated 	
WaB: Weesatche	 70 		0.50	 Somewhat limited Shrink-swell	10.50	 Somewhat limited Shrink-swell	0.50
WaC: Weesatche	 70 		10.50	 Somewhat limited Shrink-swell	10.50	 Somewhat limited Shrink-swell	0.50
WeB: Weesatche	 70 	 Somewhat limited Shrink-swell 	 0.50	 Somewhat limited Shrink-swell 	 0.50 	 Somewhat limited Shrink-swell 	 0.50

Table 12.--Roads and Streets, Shallow Excavations, and Lawns and Landscaping

and soil name	Pct. of map unit	streets	d	Shallow excavati 	ons	 Lawns and landsca 	ping
	 	=		 Rating class and limiting features 		_	
AnC: Annarose	 70	 Not limited		 Somewhat limited Cutbanks cave	0.10	 Not limited	
BcA: Buchel	 85 	Shrink-swell Flooding	1.00 1.00	Flooding	11.00	 Very limited Too clayey Flooding	1 1.00 10.60
BfA: Buchel	 90 	Shrink-swell Flooding	1.00	Flooding		• •	11.00
CaB: Campbellton	 70 	Low strength	11.00	Cutbanks cave	0.10	•	
CaC: Campbellton		Low strength	11.00	 Somewhat limited Cutbanks cave Too clayey	0.10		
CeB: Choke		Low strength		•		 Not limited 	
CeC: Choke	 70 	Low strength		 Somewhat limited Cutbanks cave 		 Not limited 	
CkA: Clareville		Low strength		•		 Not limited 	
CkB: Clareville	 70 	Low strength	 1.00 1.00	 Somewhat limited Cutbanks cave 		 Not limited 	
CnA: Condido	 70 	Depth to thin cemented pan	 1.00 1.00	cemented pan	1 1.00	 Very limited Depth to cemented pan Too clayey 	11.00
	į	Shrink-swell	1.00	Cutbanks cave	0.10	Carbonate content	1.00

Table 12.--Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

				1		1	
and soil name	Pct. of map unit		d	 Shallow excavati 	ons	 Lawns and landsca 	ping
				_ Rating class and limiting features 			
CoB: Conquista	85	 Not limited 	 			 Very limited Too clayey 	 1.00
CoG: Conquista	85	-		Slope	1.00	 Very limited Slope Too clayey	 1.00 1.00
CtB: Cotulla	70	Shrink-swell	1.00	Cutbanks cave		 Very limited Sodium content 	11.00
СуА: Соу	80	Low strength	11.00	Too clayey	 0.28 0.10		
CyB: Coy	75	Low strength	11.00	Too clayey	 0.28 0.10		
DAM: Dam	100	 Not rated 	 	 Not rated 	 	 Not rated 	
DnA: Danjer	75	Low strength	1.00	Cutbanks cave	11.00		
DnB: Danjer	70	Low strength			11.00		
EcB: Ecleto	85	bedrock Low strength	1.00 1.00	bedrock Cutbanks cave	11.00	<u> </u>	11.00
EsA: Eloso	70	 Very limited Low strength	1.00 1.00 1.00	 Somewhat limited Too clayey	 0.28 0.10 0.03	• •	1 1 1 0 0 1 0 0 0 3 1
EsB: Eloso 	70	1	 1.00 1.00	 Somewhat limited Depth to soft bedrock	 0.46 0.28 0.10	 - Very limited Too clayey - Depth to bedrock	1 1.00

Table 12.--Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

and soil name	 Pct. of map unit	streets		 Shallow excavati 	ons	 Lawns and landsca 	ping
	 	-		-		 Rating class and limiting features 	
EvA:		 		 		 	
Esseville	80 	Shrink-swell	11.00	• •		Too clayey	 1.00 1.00 0.03
EvB: Esseville	 80 	 Very limited Shrink-swell Low strength 	11.00		 1.00 1.00 0.06	Too clayey	 1.00 1.00 0.06
EvC: Esseville	 70 	 Very limited Shrink-swell Low strength 	 1.00 1.00 		 1.00 1.00 0.71	Too clayey	 1.00 1.00 0.71
Exc: Esseville	75 	Shrink-swell	11.00	•	 1.00 0.72 0.03	Too clayey	 1.00 1.00 0.10
FaC: Fashing	 75 	=	 1.00 1.00 1.00	bedrock Dense layer	 1.00 0.50 0.10	 Droughty	 1.00 1.00
GoB: Goliad	 70 	 Very limited Low strength Shrink-swell 		Somewhat limited Cutbanks cave Depth to thin cemented pan Too clayey	 0.10 0.06 0.06	pan	 0.06
HnD: Hindes	 80 	 Somewhat limited Large stones content	 0.16	 Very limited Cutbanks cave 	1 1 1 1 1 1 1 1 1 1	 Very limited Gravel content 	 1.00
	 			Large stones content Too clayey	0.16	Carbonate content	11.00
ImA: Imogene	 75 	 Somewhat limited Shrink-swell Low strength	 0.50 0.22		0.10	 Very limited Sodium content Droughty	 1.00 0.03

Table 12.--Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol and soil name	Pct. of map unit	streets		Shallow excavati 	ons	Lawns and landscaping	
	 	-		_		 Rating class and limiting features 	
LaB: Lacoste	70 70 1 1		1 1 .00	-	1.00 0.20	 	 1.00
LpB: Laparita	 75 	Low strength	11.00	 Somewhat limited Cutbanks cave Too clayey	 0.10 0.01	•	
LtA: Lattas	 85 	 Very limited Low strength Shrink-swell	 1.00 1.00				 1.00
LtB: Lattas	 75 	 Very limited Low strength Shrink-swell	1.00	 Very limited Cutbanks cave Too clayey			 1.00
MaD: Mata	 75 	 Not limited 	 	 Very limited Cutbanks cave 	1 1.00	•	 0.05 0.01
MoA: Monteola	 80 	Shrink-swell	1.00	 Very limited Cutbanks cave Too clayey	1 1.00 10.50		 1.00
MoB: Monteola	 75 	 Very limited Shrink-swell Low strength	1.00	 Very limited Cutbanks cave Too clayey 	11.00		 1.00
NuC: Nusil	 75 	 Not limited 	 	 Very limited Cutbanks cave		 Somewhat limited Droughty 	 0.45
OdA: Odem	 70 	 Very limited Flooding 	1 1.00	 Somewhat limited Flooding Cutbanks cave	 0.60 0.10		 0.60
OmD: Olmos	 80 	 Somewhat limited Depth to thin cemented pan 	1 1.00		 1.00 1.00 0.46	pan Droughty	 1.00
PaB: Papalote	 80 	 Very limited Low strength Shrink-swell 	1 1.00		0.10	 Not limited 	

Table 12.--Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

and soil name	Pct. of map unit	streets 	streets		Shallow excavations 		ping
	 					Rating class and limiting features	
PbA: Papalote	 70 	Low strength	11.00	Too clayey	 0.12 0.10	 Not limited 	
PbB: Papalote	 70 	Low strength	 1.00 0.50		 0.12 0.10	 Not limited 	
PcB: Parrita	 75 	Depth to thin cemented pan Low strength	1.00 	cemented pan Cutbanks cave	 1.00 1.00 0.64	pan Carbonate content	ĺ
PkB: Pavelek	 70 	Depth to thin cemented pan Low strength	 1.00 1.00 1.00 0.50	cemented pan Depth to soft bedrock	 1.00 0.90 0.10	pan Carbonate content	 1.00
PkC2: Pavelek, severely eroded	 70 	Depth to thin cemented pan Depth to soft bedrock	1.00 1.00	bedrock Depth to thin cemented pan	 1.00 1.00 0.10	Depth to cemented pan	l
PmC: Pernitas	 70 	Low strength	11.00	'	0.10	•	
PnB: Pernitas	 70 	Low strength		 Somewhat limited Cutbanks cave		 Not limited 	
PtC: Pettus	 75 	 Not limited 	 	 Very limited Cutbanks cave 	1 1.00	•	 1.00 0.82
PvC: Picosa	 75 		 1.00 	bedrock	 1.00 0.10	 Droughty	 1.00 1.00
Px: Pits	 90	 Not rated	 	 Not rated	 	 Not rated	

Table 12.--Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

and soil name of	 Pct. of map unit	streets	d	 Shallow excavati 	ons	 Lawns and landsca 	ping
		=		Rating class and limiting features		=	
RhC:	 75	 Not limited		 Very limited		 Somewhat limited	
Kirymes	73			•		Droughty	0.43
RoA:		177	į	177		 	į
Rosenbrock	- /5 	Very limited Low strength Shrink-swell 			 1.00 0.72		11.00
RoB: Rosenbrock	 -1 70	 Very limited		 Very limited		 Very limited	
ROSCHIDIOUN		Low strength Shrink-swell		Cutbanks cave	11.00	Too clayey	1.00
RrA: Rosenbrock		 	İ	 Very limited	İ	 Very limited	İ
ROSelibrock	- 80 	Low strength Shrink-swell Flooding		Cutbanks cave Too clayey		Too clayey	11.00
SaD:							
Sancajo	- 80 	Somewhat limited Depth to thin cemented pan		=		Very limited Depth to bedrock	11.00
	į	Depth to soft bedrock		Depth to thin cemented pan	1.00	 Depth to cemented pan	1.00
		Large stones content	0.99	Large stones content	0.99		1.00
SeD: Sarnosa	 - 80 	 Not limited 	 	 Somewhat limited Cutbanks cave 	0.10	 Not limited 	
ShC: Schattel	 - 70 	 Very limited Low strength Shrink-swell		 Somewhat limited Too clayey Cutbanks cave	0.28		11.00
StA: Sinton	 - 80 	 Very limited Flooding 	1 1.00	 Somewhat limited Flooding Cutbanks cave	 0.60 0.10		1 1 1 0 . 60
SxA:	į		į				į
Sinton	- 80 	 Very limited Flooding 	11.00	Somewhat limited Flooding Cutbanks cave	0.80	 Very limited Flooding 	11.00
TcA: Tiocano	 - 90 	 Very limited Shrink-swell Ponding	1 1.00	· -	1 1.00 11.00	-	11.00
		Depth to saturated zone	1.00		1.00		1.00
UsC: Ustarents	 - 70 	 Not rated 		 Somewhat limited Cutbanks cave		 Not limited 	

Table 12.--Roads and Streets, Shallow Excavations, and Lawns and Landscaping--Continued

Map symbol	 Pct.	 Local roads an	Local roads and				ping
and soil name	of	streets		I		1	
	map			I		I	
	unit	!		!		1	
	1		177-1		177-1	I Dating along and	177- 1
	1	-		Rating class and		=	Value
	1	limiting features	1	limiting features	1	limiting features	1
	-	I	·		·¦	l	<u> </u>
W:	i	! 		i		! 	i
Water	100	 Not rated	i	 Not rated	i	 Not rated	ì
	i	i i	i	İ	i	1	i
WaB:	İ	Ì	Ì	İ	İ	Ì	ĺ
Weesatche	- 70	Somewhat limited		Somewhat limited		Not limited	
	1	Shrink-swell	0.50	Cutbanks cave	0.10	1	
	1	I		I		1	
WaC:		I		I			
Weesatche	- 70	Somewhat limited				Not limited	1
	!	Shrink-swell	10.50	Cutbanks cave	0.10	1	!
WeB:	1	1				1	
Weesatche	1 70	 Comprehent limited	1	 Somewhat limited	1	 Not limited	1
weesatche	. /0	•			10.10	NOT limited	1
	1	SHITTHY-RMETT	10.30	Cutbanks Cave	10.10	1	1
	1	1 1	1	1	1	1	1
	- '	·	. '	· ·	- '	·	'

Table 13.--Sewage Disposal

and soil name	 Pct. of map unit	absorption field	ds	 Sewage lagoons 	3		
	 	 Rating class and limiting features 		 Rating class and limiting features 	Value		
Anc: Annarose	 70 1 1	 Somewhat limited Depth to bedrock Slow water movement			 0.50 0.42 0.32		
BcA: Buchel	 85 	'	1.00	 Very limited Flooding 	11.00		
BfA: Buchel	 90 	,	 1.00 1.00	 Very limited Flooding 	1.00		
CaB: Campbellton	70 	=	11.00	bedrock	 0.93 0.50		
CaC: Campbellton	 70 	 Very limited Slow water movement Depth to bedrock 	11.00		 0.50 0.32 0.01		
CeB: Choke	 70 	 Somewhat limited Slow water movement	 0.50	 Somewhat limited Seepage 	1 10.50		
CeC: Choke	 70 	 Somewhat limited Depth to bedrock Slow water movement 		Seepage	 0.50 0.32 0.13		
CkA: Clareville	 70 		 1.00 	 Not limited 	 		
CkB: Clareville	 70 	Slow water	11.00	 Not limited 	 		

Table 13.--Sewage Disposal--Continued

and soil name	 Pct. of map unit	absorption field		 Sewage lagoons 		
	 	 Rating class and limiting features 		 Rating class and limiting features 		
CnA: Condido	70 70 1 	Depth to bedrock	1.00 	Depth to soft bedrock Depth to cemented pan	ĺ	
CoB: Conquista	 85 	•	 1.00	 Not limited	 	
CoG: Conquista	 85 	Slope		Slope	 1.00 	
CtB: Cotulla	 70 	-	 1.00	 Not limited 	 	
СуА: Соу	 80 	-	 1.00	 Not limited 	 	
CyB: Coy	 75 	-	 1.00	 Not limited 	 	
DAM:	 100	 Not rated 	 	 Not rated 	 	
DnA: Danjer	 75 		 1.00	 Not limited 	 	
DnB: Danjer	 70 	 Very limited Slow water movement	 1.00	 Not limited 	 	
EcB: Ecleto	 85 	 Very limited Depth to bedrock 		bedrock	 1.00 0.27	
EsA: Eloso	 70 	 Very limited Slow water movement Depth to bedrock	1.00 	bedrock	 1.00 0.50	

Table 13.--Sewage Disposal--Continued

and soil name	 Pct. of map	absorption field	Sewage lagoons			
	unit 	 Rating class and		 Rating class and limiting features		
EsB: Eloso	 70 	 Very limited Slow water movement Depth to bedrock	1.00 	bedrock	 1.00 0.50	
EvA: Esseville	 80 	 Very limited Slow water movement Depth to bedrock	1.00 	 Very limited Depth to soft bedrock	 1.00 	
EvB: Esseville	 80 	 Very limited Slow water movement Depth to bedrock	1.00 	 Very limited Depth to soft bedrock	 1.00 	
EvC: Esseville	70 	 Very limited Slow water movement Depth to bedrock	1.00 	bedrock	 1.00 0.32	
ExC: Esseville	 75 	 Very limited Slow water movement Depth to bedrock	1.00 	bedrock	 	
FaC: Fashing	 75 	 Very limited Depth to bedrock 		bedrock	 1.00 0.32	
GoB: Goliad	 70 	Depth to cemented pan	1.00 1.00	pan Depth to soft bedrock	 1.00 0.96 0.27	
HnD: Hindes	 80 	movement	 0.50 0.16	content Slope 	 1.00 0.92 	
ImA: Imogene	 75 	 Very limited Slow water movement 	 1.00 	 Not limited 	 	

Table 13.--Sewage Disposal--Continued

and soil name	Pct. of map unit	absorption field	ds	Sewage lagoons 		
	 			 Rating class and limiting features 		
LaB: Lacoste	 70 	 Very limited Depth to bedrock Depth to cemented pan	11.00	bedrock Depth to cemented pan	 1.00 1.00 	
LpB: Laparita	 75 	 Very limited Slow water movement Depth to bedrock	11.00	 Somewhat limited	 0.05	
LtA: Lattas	 85 	 Very limited Slow water movement	 1.00	 Not limited 	 	
LtB: Lattas	 75 	 Very limited Slow water movement	 1.00	 Not limited 	 	
MaD: Mata	 75 	 Somewhat limited Depth to bedrock Slow water movement		bedrock Seepage 	 0.88 0.50 	
MoA: Monteola	 80 		 1.00	 Not limited 	 	
MoB: Monteola	 75 	 Very limited Slow water movement	 1.00	 Not limited 	 	
NuC: Nusil	 75 	 Very limited Slow water movement 	 1.00 		 1.00 0.08	
OdA: Odem	 70 		 1.00 1.00		 1.00 1.00	
OmD: Olmos	 80 	 Very limited Depth to bedrock Depth to cemented pan 	1.00 	bedrock Depth to cemented pan	 1.00 1.00 0.68	

Table 13.--Sewage Disposal--Continued

and soil name	 Pct. of map unit	absorption field	 Sewage lagoons 		
	 	Rating class and limiting features		 Rating class and limiting features 	Value
PaB: Papalote	 80 	-	 1.00	 Not limited 	
PbA: Papalote	 70 	 Very limited Slow water movement	 1.00	 Not limited 	
PbB: Papalote	70 	 Very limited Slow water movement	 1.00	 Not limited 	
PcB: Parrita	 75 	 Very limited Depth to bedrock Depth to cemented pan	11.00	bedrock	 1.00 1.00
PkB: Pavelek	 70 	 	1.00 	 Very limited Depth to soft bedrock Depth to cemented pan	I
PkC2: Pavelek, severely eroded	 70 	Depth to bedrock	11.00	bedrock Depth to cemented pan	1
PmC: Pernitas	 70 	 Somewhat limited Slow water movement 	 0.50 		 0.50 0.32
PnB: Pernitas	 70 	 Somewhat limited Slow water movement	 0.50 	 Somewhat limited Seepage 	 0.50
PtC: Pettus	75 		 1.00 0.50 		 1.00 0.32

Table 13.--Sewage Disposal--Continued

		 I		 	
and soil name	Pct. of map unit	absorption field	ds	Sewage lagoons	
	 	=		 Rating class and limiting features 	
PvC: Picosa	 75 			Depth to soft bedrock Seepage	 0.27
Px: Pits	 90	 Not rated	 	Slope Not rated	0.08
RhC: Rhymes	 75 	. 4			 1.00 0.08
RoA: Rosenbrock	 75 	=	1.00	 Not limited 	
RoB: Rosenbrock	 70 		11.00	I	
RrA: Rosenbrock	 80 	Slow water movement		 Somewhat limited Flooding 	 0.40
SaD: Sancajo	 80 	Depth to bedrock Depth to cemented pan	1.00 1.00	 Very limited Depth to soft bedrock Depth to cemented pan Large stones content	I
SeD: Sarnosa	 80 		 1.00 0.50		 1.00 0.92
ShC: Schattel	 70 	 Very limited Slow water movement Depth to bedrock	1.00 		 0.32 0.26
StA: Sinton	 80 	=	 1.00 0.50 	-	 1.00 0.50

Table 13.--Sewage Disposal--Continued

and soil name	 Pct. of map unit	absorption fiel	ds	 Sewage lagoons 	3
		Rating class and limiting features			
SxA: Sinton	 80 	Flooding	11.00	 Very limited Flooding Seepage	11.00
TcA: Tiocano	 90 	movement Ponding	11.00	 Very limited Ponding Depth to saturated zone 	 1.00 1.00
UsC: Ustarents	70 	•		 Somewhat limited Seepage Slope	 0.50 0.32
W: Water	 100	 Not rated 		 Not rated 	
WaB: Weesatche	 70 	•		 Somewhat limited Seepage 	10.50
WaC: Weesatche	 70 			 Somewhat limited Seepage Slope	 0.50 0.32
WeB: Weesatche	 70 	•	 0.50 	 Somewhat limited Seepage 	 0.50

Table 14.--Landfills

Map symbol and soil name	Pct. of map unit	l landfill	У	Area sanitary landfill 		Daily cover fo I landfill	r
	 	 Rating class and limiting features 				Rating class and limiting features	
AnC: Annarose	1 70	 		 - Not limited		 	
BcA: Buchel		Flooding				 Very limited Too clayey Hard to compact	1.00
BfA: Buchel	90	Flooding	1.00		1 1.00	 Very limited Too clayey Hard to compact	1.00
CaB: Campbellton			1 1.00	 Not limited 		 Very limited Too clayey	11.00
CaC: Campbellton	 70 		1 1 1 1 1 1 1 1 1 1	 Not limited 	 	 Very limited Too clayey Hard to compact	1.00
CeB: Choke	70	 Not limited		 Not limited		 Not limited	
CeC: Choke	70	 Not limited 		 Not limited 		 Very limited Hard to compact	11.00
CkA: Clareville	 70	 Not limited 	 	 Not limited 		 Very limited Hard to compact	1 1.00
CkB: Clareville	 70 1		 0.50	 Not limited 	 	 Very limited Hard to compact Too clayey	1.00
CnA: Condido	70	=	1 1.00	 Very limited Depth to cemented pan		 Very limited Depth to cemented pan	 1.00
	 	Depth to thin cemented pan 	0.50 	 	 	=	1.00 1.00
CoB: Conquista	 85	 Not limited	 	 Not limited		 	
CoG: Conquista	 85 	-	1 1.00	 Very limited Slope	11.00	 Very limited Slope	11.00

Table 14.--Landfills--Continued

and soil name	Pct. of map unit	l landfill	У	Area sanitary landfill 	•	Daily cover fo	r
	 	-		 Rating class and limiting features 		_	
CtB: Cotulla	 - 70 	Too clayey	 1.00 1.00		 	 - Very limited Too clayey Hard to compact Sodium content	 1.00 1.00 1.00
CyA: Coy	 - 80 		 1.00 	 Not limited 	 	 Very limited Too clayey Hard to compact 	 1.00 1.00
CyB: Coy	- 75 		11.00	 Not limited 		 Very limited Too clayey Hard to compact	11.00
DAM: Dams	- 100	 Not rated 	 	 Not rated 	 	 Not rated 	
DnA: Danjer	 - 75 	· =	11.00	 Not limited 		 Very limited Too clayey Hard to compact	11.00
DnB: Danjer	- 70 	· =	11.00	 Not limited 	 		 1.00 1.00
EcB: Ecleto	 - 85 	Depth to bedrock		 Very limited Depth to bedrock 		_	11.00
EsA: Eloso	 - 70	 Not limited 	 	 Not limited 	 	 Not limited 	
EsB: Eloso	- 70	 Not limited 	i 	 Not limited 	i 	 Not limited 	i
EvA: Esseville	 - 80 	Too clayey	11.00			 Very limited Too clayey Hard to compact Sodium content	 1.00 1.00 1.00
EvB: Esseville	 - 80 	Too clayey	11.00		 	 Very limited Too clayey Hard to compact Sodium content	 1.00 1.00 1.00
EvC: Esseville	 - 70 	Too clayey	11.00		 	 Very limited Too clayey Hard to compact Sodium content	 1.00 1.00 1.00

Table 14.--Landfills--Continued

Map symbol and soil name	Pct. of map unit	l landfill	У	Area sanitary landfill 		Daily cover fo: landfill	r
		-		 Rating class and limiting features		-	
ExC: Esseville	 - 75 	Excess sodium	1 1.00		 	Too clayey	 1.00 1.00 1.00
FaC: Fashing	 - 75 	Depth to bedrock		=		Hard to compact	
GoB: Goliad	 - 70 	Depth to thin cemented pan	 0.50 0.50	pan		pan Hard to compact	
HnD: Hindes	 - 80 		 0.01 	 Not limited 	 	•	 1.00 0.03 0.01
ImA: Imogene	 - 75	-		 Not limited 	 	content Very limited Sodium content	 1.00
LaB: Lacoste	 - 70 	Depth to bedrock		Depth to cemented pan	1.00 	pan	
LpB: Laparita	 - 75 	-	 1.00	 Not limited 	 	= =	 1.00 1.00
LtA: Lattas	 - 85 	-		 Not limited 	 		 1.00 1.00
LtB: Lattas	 - 75 	-	1 1.00	 Not limited 	 		1 1.00
MaD: Mata	 - 75 	 Very limited Depth to bedrock 		 Not limited 	 	 Somewhat limited Depth to bedrock Gravel content	 0.88 0.09
MoA: Monteola	 - 80 	 Very limited Too clayey 	 1.00	 Not limited 	 		 1.00 1.00

Table 14.--Landfills--Continued

Map symbol and soil name			У	Area sanitary landfill 		Daily cover fo landfill	r
	 	=		Rating class and limiting features		_	
MoB: Monteola	 - 75 		1 1 1 1 1 1 1 1 1 1	 Not limited 	 	·	1 1.00
NuC: Nusil	 - 75 			 Very limited Seepage 		· •	 1.00 1.00
OdA: Odem	 - 70 	Flooding	 1.00 1.00		 1.00 1.00	 Somewhat limited Seepage 	 0.50
OmD: Olmos	 - 80 	Depth to bedrock		pan	1.00 	pan Depth to bedrock Carbonate content	 1.00
PaB: Papalote	- 80	 Not limited		 Not limited	 	 Not limited	
PbA: Papalote	 - 70	 Not limited		 Not limited	 	 Not limited	
PbB: Papalote	 - 70	 Not limited		 Not limited	 	 Not limited	
PcB: Parrita	 - 75 	Depth to bedrock Depth to thin cemented pan		pan	1.00 	pan Depth to bedrock	1
PkB: Pavelek	 	 Very limited Too clayey Depth to thin cemented pan	 1.00 0.50	 Very limited Depth to cemented pan 		I	 1.00 1.00
PkC2: Pavelek, severely eroded	 - 70 	 - Very limited Too clayey Depth to thin cemented pan	 1.00 0.50	 	 1.00 	pan Too clayey 	 1.00 1.00

Table 14.--Landfills--Continued

Map symbol and soil name	Pct. of map unit	landfill	У	Area sanitary I landfill		Daily cover fo	Daily cover for landfill 		
	 	-		=		 Rating class and limiting features			
PmC: Pernitas	- -	 Not limited	 	 Not limited		 Very limited Hard to compact	 1.00		
PnB: Pernitas	 - 70		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	 Not limited 		 Somewhat limited Too clayey	 0.50		
PtC: Pettus	 - 75 	· •	1 1.00	 Not limited 	 	 Very limited Carbonate content Gravel content	 1.00 0.66		
PvC: Picosa	 - 75 	Depth to bedrock Excess sodium		ĺ		 Very limited Depth to bedrock 	 1.00 		
Px: Pits	 - 90	 Not rated 		 Not rated 	 	 Not rated 			
RhC: Rhymes	 - 75 	· •	11.00	 Very limited Seepage 	11.00	•	1.00		
RoA: Rosenbrock	 - 75 	•	1 1.00	 Not limited 	 		1 1.00		
RoB: Rosenbrock	 - 70 	· •	11.00	 Not limited 	 		1.00		
RrA: Rosenbrock	 - 80 	Too clayey	11.00	-	0.40		1.00		
SaD: Sancajo	 - 80 	Large stones content	 0.99 0.50 	pan	 1.00 	pan Carbonate content Large stones content			
SeD: Sarnosa	 - 80 	 Very limited Seepage	1.00	 Not limited 		 Not limited 	 		
ShC: Schattel	- 70 	Too clayey	11.00		 	Hard to compact	 1.00 1.00 1.00		

Table 14.--Landfills--Continued

and soil name	of	Pct. Trench sanitary of landfill map		Area sanitary I landfill		Daily cover for landfill 		
	 			Rating class and limiting features 				
StA: Sinton	 80 	 Very limited Flooding			1 1 1 1 1 1 1 1 1 1	 Not limited 	 	
SxA: Sinton	 80 	Flooding	11.00	Flooding		 Somewhat limited Seepage 	 0.50	
TcA: Tiocano	 90 	Depth to Saturated zone Ponding	11.00	Ponding Depth to saturated zone	1.00 1.00	İ	 1.00 1.00 1.00 1.00	
UsC: Ustarents	 70	 Not rated	 	 Not limited		 Not rated		
W: Water	1100	 Not rated		 Not rated		 Not rated		
WaB: Weesatche	70	 Not limited		 Not limited		 Not limited		
WaC: Weesatche	70	 Not limited		 Not limited		 Not limited		
WeB: Weesatche	 70 	•	 0.50	 Not limited 	 	 Somewhat limited Too clayey 	 0.50	
	i 	i	i	i	i	i	i	

Table 15.--Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge

and soil name	Pct. Application on of manure and food map processing was unit		_	Application of sewage sludge 	
	 			 Rating class and limiting features 	
AnC: Annarose	 70	 Not limited	 	 Not limited	
BcA: Buchel	 85 	Slow water movement Flooding	1.00 0.60	movement Flooding	 1.00 1.00 0.08
BfA: Buchel	 90 	movement Flooding	1.00 1.00	movement Flooding	 1.00 1.00 1.00
CaB: Campbellton	 70 			 Somewhat limited Slow water movement	 0.37
CaC: Campbellton	 70 	Slow water movement		movement	 0.37
CeB: Choke	 70 	 Not limited 	 	 Not limited 	
CeC: Choke	 70 	 Not limited 	 	 Not limited 	
CkA: Clareville	 70 	•	•	 Somewhat limited Slow water movement	 0.37
CkB: Clareville	 70 	 Somewhat limited Slow water movement 	 0.50	 Somewhat limited Slow water movement	 0.37
CnA: Condido	70 	movement Depth to cemented pan	1.00 1.00	movement Depth to cemented pan	
	 	Droughty 	1.00 	Droughty 	1.00

Table 15.--Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge--Continued

and soil name	Pct. of map unit	manure and food processing was	_	Application of sewage sludge		
		=		 Rating class and limiting features 		
CoB: Conquista	 85 	 Very limited Slow water movement	1.00 	movement	1 1.00	
		Dense layer Runoff 	1.00 0.40	Sodium content 	0.08 	
CoG: Conquista	85 85	 Very limited Slope 		 Very limited Slow water movement	11.00	
		Slow water movement	1.00	•	1.00	
		Dense layer 	1.00 	Sodium content 	0.08 	
CtB: Cotulla	 70 	 Very limited Slow water movement Sodium content Runoff	 1.00 1.00 0.40	movement	 1.00 1.00	
CyA: Coy	 80 	 Very limited Slow water movement Runoff Sodium content			1 1.00 1 0.02	
CyB: Coy	 75 	 Very limited Slow water movement Runoff Sodium content		 Very limited Slow water movement Sodium content	1 1.00 10.02	
DAM: Dam	 100	 Not rated	 	 Not rated	 	
DnA: Danjer	 75 	 Very limited Slow water movement Runoff	 1.00 0.40	 Very limited Slow water movement	1 1 .00	
DnB: Danjer	 70 	 Very limited Slow water movement Runoff	11.00	 Very limited Slow water movement 	1 1.00	
EcB: Ecleto	 85 	 Very limited Slow water movement	1.00 		1	
		Depth to bedrock Droughty	1.00 0.99	movement	1.00 0.99	

Table 15.--Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge--Continued

and soil name	Pct. of map unit	manure and food- processing was	-	 Application of sewage sludg 	е
	 	=		 Rating class and limiting features 	
EsA: Eloso	 70 	movement	1.00	 - Very limited Slow water movement Depth to bedrock	 1.00 0.03
	 	'		Shallow to densic materials	
EsB: Eloso	 70 	movement Depth to bedrock	1.00 0.46	 Very limited Slow water movement Depth to bedrock Shallow to densic materials	
EvA: Esseville	 80 	 Very limited Slow water movement Runoff	1.00 0.40	 Very limited Slow water movement	 1.00 0.32 0.03
EvB: Esseville	 80 	movement Sodium content	1.00 1.00	movement Sodium content	 1.00 1.00
EvC: Esseville	 70 	 Very limited Slow water movement Depth to bedrock	1.00 0.71	 Very limited	 1.00 0.71
ExC: Esseville	 75 	Slow water movement Sodium content	 1.00 1.00 1.00	movement Sodium content	 1.00 1.00 0.03
FaC: Fashing	 75 	movement Depth to bedrock	1.00 	Depth to bedrock	 1.00 1.00 1.00
GoB: Goliad	 70 		 0.71 0.50	movement Somewhat limited Droughty Slow water movement	 0.71 0.37

Table 15.--Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge--Continued

Map symbol and soil name	Pct. of map unit	of manure and food- up processing waste		Application of sewage sludge 		
	 			 Rating class and limiting features		
	 	Depth to cemented pan	 0.06 	Depth to cemented pan	 0.06 	
HnD: Hindes	 80 	movement	0.50	movement	0.37	
ImA: Imogene	 75 	movement Sodium content	 1.00 1.00 0.50	movement	 1.00 1.00	
LaB: Lacoste	 70 		1.00 1.00	Depth to cemented pan	ĺ	
LpB: Laparita	 75 	Slow water movement	 0.50 0.50	 Very limited Low adsorption Slow water movement	0.20 1.00 0.37 	
LtA: Lattas	 85 	 Very limited Slow water movement	 	 Very limited	 1.00 	
LtB: Lattas	 75 	movement		movement	 1.00	
MaD: Mata	 75 	Sodium content	0.51	Droughty	 1.00 0.51 0.18	
MoA: Monteola	 80 	Slow water movement		movement	 1.00 	
MoB: Monteola	 75 	movement Runoff	 1.00 0.40	movement	 1.00 1.00	

Table 15.--Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge--Continued

and soil name	Pct. of map unit	manure and food- processing was	-	Application of sewage sludge 		
	 	 Rating class and limiting features 		 Rating class and limiting features 		
NuC: Nusil	75 75 1	movement Filtering	1.00	movement	 1.00 0.99	
OdA: Odem	 70 	 Somewhat limited		 Very limited	 1.00	
OmD: Olmos	 80 	 Very limited Depth to cemented pan Droughty	1.00 		 1.00 1.00	
	 	 Depth to bedrock	 0.46	pan Depth to bedrock	0.46	
PaB: Papalote	 80 	-		 Very limited Slow water movement	1 1.00	
PbA: Papalote	 70 			 Very limited Slow water movement	1 1.00	
PbB: Papalote	 70 			 Very limited Slow water movement	 1.00	
PcB: Parrita	 75 	Depth to cemented pan Droughty	1.00 1.00	Low adsorption	11.00	
PkB: Pavelek	 70 	movement Depth to cemented pan	 1.00	 Very limited Depth to cemented pan Low adsorption	1.00 1.00 1.00	
PkC2: Pavelek, severely eroded	 70 	 Very limited 	 1.00	 Very limited Droughty Depth to bedrock	 1.00	

Table 15.--Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge--Continued

and soil name		processing waste		 Application of sewage sludg 	e
	 	 Rating class and limiting features 		 Rating class and limiting features 	
PmC: Pernitas	 70	 Not limited 	 	 Not limited	
PnB: Pernitas	1 70	 Not limited	 	 Not limited	
PtC: Pettus	 75 			 Somewhat limited Droughty	 0.33
PvC: Picosa	 75 	Depth to bedrock Droughty	1.00 1.00	 Very limited Droughty Depth to bedrock Sodium content	
Px: Pits	 90	 Not rated 	 	 Not rated 	
RhC: Rhymes	 75 	Filtering capacity Slow water movement	0.99 	capacity Slow water movement	 0.99 0.37
RoA: Rosenbrock	 75 	Slow water movement		movement	 1.00
RoB: Rosenbrock	 70 	Slow water movement		movement	 1.00
RrA: Rosenbrock	 80 	Slow water movement	 1.00 0.40	movement	 1.00 0.40
SaD: Sancajo	 80 	Depth to bedrock Depth to cemented pan	11.00	Depth to bedrock	
SeD: Sarnosa	 80 	 Not limited 	 	 Not limited 	

Table 15.--Agricultural Disposal of Manure, Food-Processing Waste, and Sewage Sludge--Continued

and soil name		processing waste		Application of sewage sludge	
		Rating class and limiting features 			
ShC: Schattel	 70 	Slow water movement Sodium content	11.00	movement Sodium content	 1.00 0.08
StA: Sinton				-	1 1.00
SxA: Sinton	 80 	 - Very limited Flooding	 1.00	 Very limited Flooding	1.00
TcA: Tiocano	 90 	Slow water movement Ponding Depth to	1.00 1.00	movement Ponding	 1.00 1.00 1.00
UsC: Ustarents	 70	 Not limited	 	 Not limited	
W: Water	1 100	 Not rated 	 	 Not rated 	
WaB: Weesatche	, 70	 Not limited	 	 Not limited	
WaC: Weesatche	, 70	 Not limited	 	 Not limited	
WeB: Weesatche	 70 	 Not limited 	 	 Not limited 	

Table 16.--Agricultural Disposal of Wastewater by Irrigation and Overland Flow

* *	 Pct. of map unit	wastewater by irrigation		 Overland flow of wastewater 		
	 	 Rating class and limiting features 		 Rating class and limiting features 		
AnC: Annarose	 70 		0.08	 - Very limited Seepage Depth to bedrock	1 1.00	
BcA: Buchel	 85 	•	 1.00	 Very limited Flooding 	11.00	
	 				0.50 0.08	
BfA: Buchel	 90 	Slow water movement Flooding	1.00 	Too level	 1.00 0.50 0.08	
CaB: Campbellton	 70 		 0.37 	 Very limited Seepage Depth to bedrock	 1.00 0.94	
CaC: Campbellton	 70 	Slow water movement	0.37 	 Very limited Seepage Depth to bedrock	 1.00 0.01	
CeB: Choke	 70 	 Not limited 	 	 Very limited Seepage	 1.00	
CeC: Choke	 70 	 Somewhat limited Too steep 	 0.08	 Very limited Seepage Depth to bedrock	 1.00 0.14	
CkA: Clareville	 70 	 Somewhat limited Slow water movement	 0.37	 Very limited Seepage Too level	1.00	
CkB: Clareville	 70 	 Somewhat limited Slow water movement 	 0.37 	 Very limited	1 1.00	

Table 16.--Agricultural Disposal of Wastewater by Irrigation and Overland Flow--Continued

and soil name	Pct. of map unit	wastewater by irrigation		 Overland flow o: wastewater 	f
	 	 Rating class and limiting features 		 Rating class and limiting features 	
CnA: Condido	 70 	Slow water movement Depth to cemented pan	1.00 1.00	 - Very limited Depth to bedrock Depth to cemented pan	l
CoB: Conquista	 85 	 Very limited	1.00	 Somewhat limited Sodium content 	 0.08
CoG: Conquista	 85 	Slow water movement Too steep	1.00 	 Sodium content	 1.00 0.08
CtB: Cotulla	 70 		1.00 	I	 1.00
CyA: Coy	 80 	 Very limited Slow water movement Sodium content	1.00	Too level	 0.62 0.50 0.02
Сув:	 75 	Slow water movement	1.00	 Somewhat limited	 0.62
DAM: Dam	 100 	 Not rated 	 	 Not rated 	
DnA: Danjer	 75 		 1.00 	 Somewhat limited Too level 	 0.50
DnB: Danjer	 70 	=	 1.00 	 Not limited 	
EcB: Ecleto	 85 	-	1.00	 Very limited Depth to bedrock Seepage 	 1.00 0.62
	 	 Droughty 	 0.99 	 Sodium content 	 0.08

Table 16.--Agricultural Disposal of Wastewater by Irrigation and Overland Flow--Continued

and soil name	 Pct. of map unit	wastewater by irrigation		Overland flow of wastewater	
	 			 Rating class and limiting features 	
EsA: Eloso	 70 	•	11.00	 - Very limited Depth to bedrock Too level	 1.00 0.50
EsB: Eloso	 70 	 Very limited Slow water movement Depth to bedrock	1.00 		
EvA: Esseville	 80 	Slow water movement Sodium content	1.00 0.32	'	 1.00 0.50 0.32
EvB: Esseville	 80 	Slow water movement	1.00 1.00	 Very limited Depth to bedrock Sodium content 	1
EvC: Esseville	 70 1 	Slow water movement	1.00 0.71	 Very limited Depth to bedrock Sodium content 	1
ExC: Esseville	 75 1 	Slow water movement	1.00 1.00		 1.00 1.00
FaC: Fashing	 75 	Depth to bedrock	1.00	1	 1.00
GoB: Goliad	 70 	, , ,	0.71 0.37 	Depth to cemented pan	1
HnD: Hindes	 80 81 	Slow water movement	 0.68 0.37 0.05	Cobble content	 1.00 0.77

Table 16.--Agricultural Disposal of Wastewater by Irrigation and Overland Flow--Continued

and soil name	Pct. of map unit	wastewater by irrigation		Overland flow of wastewater	
	 	 Rating class and limiting features 		 Rating class and limiting features 	
ImA: Imogene	 75 	Slow water movement	11.00	 Seepage	 1.00 1.00 0.50
LaB: Lacoste	 70 	=	1.00 1.00 	 Very limited Depth to bedrock Depth to cemented pan	 1.00
LpB: Laparita	 75 	movement	0.37		 1.00 0.32 0.05
LtA: Lattas	 85 	· ±	 1.00	 Somewhat limited Too level 	 0.50
LtB: Lattas	 75 	 Very limited Slow water movement	 1.00	 Not limited 	
MaD: Mata	 75 	Sodium content	0.51 0.18	Depth to bedrock	 1.00 0.88 0.18
MoA: Monteola	 80 81	 Very limited Slow water movement	 1.00	 Somewhat limited Too level 	 0.50
MoB: Monteola	 75 	 Very limited Slow water movement	 1.00	 Not limited 	
NuC: Nusil	 75 	movement	 1.00 0.99	 Very limited Seepage 	 1.00
OdA: Odem	 70 	 Somewhat limited Flooding 	 0.60 	Seepage Too level	 1.00 1.00 0.50

Table 16.--Agricultural Disposal of Wastewater by Irrigation and Overland Flow--Continued

and soil name	 Pct. of map unit	wastewater by irrigation		Overland flow of wastewater 	
	 			 Rating class and limiting features 	
OmD: Olmos	 80 	Droughty	1.00 1.00 	 - Very limited Depth to bedrock Depth to cemented pan Seepage	
PaB: Papalote	 80 	-	 1.00	 Very limited Seepage 	 1.00
PbA: Papalote	 70 	· ±	 1.00 		 1.00 0.50
PbB: Papalote	 70 	•	 1.00	 Very limited Seepage 	 1.00
PcB: Parrita	 75 	pan	1.00 	 Very limited Depth to bedrock Depth to cemented	
PkB:	 	Depth to bedrock	 0.65 	pan Seepage 	 1.00
Pavelek	70 	Depth to cemented pan Droughty Slow water	1.00 		
PkC2: Pavelek, severely eroded			 1.00 1.00	· <u>-</u>	
PmC: Pernitas	 70 	 Somewhat limited Too steep 	 0.08	 Very limited Seepage	1 1 1 1 1 1 1 1 1 1
PnB: Pernitas	 70 	 Not limited 	 	 Very limited Seepage 	 1.00
PtC: Pettus	 75 		 0.33 0.08		 1.00

Table 16.--Agricultural Disposal of Wastewater by Irrigation and Overland Flow--Continued

and soil name	of map	Pct. Disposal of of wastewater map by irrigation unit		Overland flow of wastewater		
	 	-		 Rating class and limiting features 		
PvC: Picosa	 75 	Droughty Depth to bedrock	1.00 1.00	 Very limited Depth to bedrock Seepage Sodium content	11.00	
Px: Pits	 90 	 Not rated 	 	 Not rated 	 	
RhC: Rhymes	75 75 1	Filtering capacity			 1.00 	
RoA: Rosenbrock	 75 		 1.00	 Somewhat limited Too level 	 0.50	
RoB: Rosenbrock	 70 		 1.00	 Not limited 	 	
RrA: Rosenbrock	 80 	•	 1.00 	I	0.50	
SaD: Sancajo	 80 	Droughty	1.00 1.00 	 Very limited Depth to bedrock Depth to cemented pan Seepage 		
SeD: Sarnosa	 80 	 Somewhat limited Too steep	 0.68	 Very limited Seepage	 1.00	
ShC: Schattel	 70 	Slow water movement Too steep	1.00 	 Depth to bedrock	 1.00 0.26 0.08	
StA: Sinton	 80 81 	 Somewhat limited Flooding 	 0.60 	Seepage	 1.00 1.00 0.50	

Table 16.--Agricultural Disposal of Wastewater by Irrigation and Overland Flow--Continued

of
Value
 1.00 1.00 0.50
11.00
11.00
11.00
11.00
1 1.00

Table 17.--Agricultural Disposal of Wastewater by Infitration and Treatment of Wastewater

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

and soil name	 Pct. of map unit	of wastewater		 Slow rate treatment of wastewater 	
	 	 Rating class and limiting features 			
AnC: Annarose	 70 	 Very limited Depth to bedrock Slow water movement		-	 0.42 0.08
BcA: Buchel	 85 	movement	 1.00 0.60	movement Flooding	1 1.00 1 10.60 10.08
BfA: Buchel	 90 		 1.00 1.00 	Slow water movement	1.00
CaB: Campbellton	 70 	 Very limited Slow water movement Depth to bedrock	11.00		 0.94 0.26
CaC: Campbellton	 70 	 Very limited Slow water movement Depth to bedrock	11.00	movement	 0.26 0.08 0.01
CeB: Choke	 70 	 Very limited Slow water movement	1 1 1 1 1 1 1 1 1 1	 Not limited 	
CeC: Choke	 70 	 Very limited Depth to bedrock Slow water movement		•	 0.14 0.08
CkA: Clareville	 70 	 Very limited Slow water movement 	1.00	 Somewhat limited Slow water movement 	 0.26

Table 17.--Agricultural Disposal of Wastewater by Infitration and Treatment of Wastewater--Continued

Map symbol and soil name	Pct. of map unit	of of wastewater map		 Slow rate treatment of wastewater 	
	 	=		 Rating class and limiting features 	
CkB: Clareville	 70 	· ±	1 1 1 . 00	 Somewhat limited Slow water movement	 0.26
CnA: Condido	70 	Slow water movement	1.00 1.00	Depth to cemented pan	
CoB: Conquista	 85 	=		movement	 1.00 0.08
CoG: Conquista	 85 	Slope	11.00	Too steep	 1.00 1.00 1.00
CtB: Cotulla	 70 	 - Very limited Slow water movement 		i I	 1.00 1.00
СуА: Соу	 80 	 Very limited Slow water movement	11.00	movement	 1.00 0.02
CyB: Coy	 75 	 Very limited Slow water movement		movement	1 1.00
DAM: Dam	1100	 Not rated 	 	 Not rated 	
DnA: Danjer	 75 	-		 Very limited Slow water movement	 1.00
DnB: Danjer	70 	-		 Very limited Slow water movement 	 1.00

Table 17.--Agricultural Disposal of Wastewater by Infitration and Treatment of Wastewater--Continued

and soil name				Slow rate treatment of wastewater 	
	 	-		 Rating class and limiting features 	
EcB: Ecleto	 85 	-	1 1.00	 Very limited Depth to bedrock	1 1.00
	 	Depth to bedrock 	1.00 	Slow water movement Sodium content	0.94
EsA: Eloso	 70 	Slow water movement	1.00 	 Very limited Depth to bedrock	1
	 	Depth to bedrock 	1.00 	Slow water movement 	11.00
EsB: Eloso	 70 		11.00	 Very limited Depth to bedrock Slow water movement	11.00
EvA: Esseville	 80 81 1		1.00 	 Very limited Depth to bedrock Slow water movement	 1.00 1.00 0.32
EvB: Esseville	 80 	Slow water movement	1.00 	•	 1.00 1.00 1.00
EvC: Esseville	 70 		11.00	 Slow water movement	 1.00 1.00 0.32
ExC: Esseville	 75 	 Very limited Slow water movement Depth to bedrock	1.00 	 Slow water movement	 1.00 1.00
FaC: Fashing	 75 	 Very limited Slow water movement Depth to bedrock	1.00 		 1.00 0.94

Table 17.--Agricultural Disposal of Wastewater by Infitration and Treatment of Wastewater--Continued

Map symbol and soil name	of map	Pct. Rapid infiltration of of wastewater map unit		Slow rate treatment of wastewater	
	 	 Rating class and limiting features 		 Rating class and limiting features 	
GoB: Goliad	 70 	movement	1.00 1.00	pan Depth to bedrock	
HnD: Hindes	 80 	movement Slope	 1.00 0.50 0.27		 0.68 0.26
ImA: Imogene	 75 	 Very limited Slow water movement 	 1.00 		1 1.00
Lacoste	 70 	 Very limited Depth to bedrock Depth to cemented pan Slow water movement	11.00		
LpB: Laparita	 75 	 Very limited Slow water movement Depth to bedrock 	11.00		 0.32 0.26 0.05
LtA: Lattas	 85 	 Very limited Slow water movement	11.00	 Very limited Slow water movement	 1.00
LtB: Lattas	 75 	 Very limited Slow water movement		 Very limited Slow water movement	1 1 1 1 1 1 1 1 1 1
MaD: Mata	75 	 Very limited Depth to bedrock Slow water movement 		Sodium content 	 0.88 0.18 0.08

Table 17.--Agricultural Disposal of Wastewater by Infitration and Treatment of Wastewater--Continued

and soil name	 Pct. of map unit	of of wastewater ap		 Slow rate treatment of wastewater 	
	 	Rating class and limiting features		 Rating class and limiting features 	
MoA: Monteola	 80 			 Very limited Slow water movement	 1.00
MoB: Monteola	 75 	· •	 1.00	 Very limited Slow water movement	1 1.00
NuC: Nusil	 75 	 Very limited Slow water movement 		capacity	 0.99 0.94
OdA: Odem	 70 	Flooding	 0.60 0.32 		 0.60
OmD: Olmos	 80 	Depth to bedrock Depth to cemented pan	11.00	 Very limited Depth to bedrock Depth to cemented pan Too steep	
PaB: Papalote	 80 	•	 1.00	 Somewhat limited Slow water movement	 0.94
PbA: Papalote	 70 	=		 Somewhat limited Slow water movement	 0.94
PbB: Papalote	 70 	 Very limited Slow water movement	 1.00	 Somewhat limited Slow water movement	 0.94
PcB: Parrita	 75 	 Very limited Slow water movement Depth to bedrock Depth to cemented pan	1.00 1.00 	Depth to cemented pan	1

Table 17.--Agricultural Disposal of Wastewater by Infitration and Treatment of Wastewater--Continued

and soil name				Slow rate treatment of wastewater 	
	 	 Rating class and limiting features 		 Rating class and limiting features 	
PkB: Pavelek	 70 	Slow water movement	1.00 	 Very limited Depth to bedrock Depth to cemented	
	 	 Depth to cemented pan	 1.00 	pan Slow water movement	 0.94
PkC2: Pavelek, severely eroded	 70	 Very limited 	 	 Very limited 	
010404	 	Slow water movement	1.00	Depth to bedrock	1.00
	i I	Depth to bedrock	1.00 	Depth to cemented pan	11.00
	 	Depth to cemented pan	1.00 		0.94
PmC: Pernitas	70 	-		 Somewhat limited Too steep	 0.08
PnB: Pernitas	 70 	-	 1.00	 Not limited 	
PtC: Pettus	, 75 	-		 Somewhat limited Too steep	 0.08
PvC: Picosa	 75 	=	11.00	 Very limited Depth to bedrock Sodium content	
Px: Pits	 90	 Not rated 	 	 Not rated 	'
RhC: Rhymes	 75 	 Very limited Slow water movement 		capacity	 0.99 0.26
RoA: Rosenbrock	75 	=	11.00	movement	 1.00
RoB: Rosenbrock	 70 	=	1.00 	movement	 1.00

Table 17.--Agricultural Disposal of Wastewater by Infitration and Treatment of Wastewater--Continued

and soil name	Pct. Rapid infiltration of of wastewater map unit			Slow rate treatment of wastewater 		
	 	 Rating class and limiting features 		 Rating class and limiting features 		
RrA: Rosenbrock					1 1.00	
SaD: Sancajo	 80 	Depth to bedrock Depth to cemented pan	1.00 1.00	 Very limited Depth to bedrock Depth to cemented pan Too steep		
SeD: Sarnosa	 80 	Slow water movement		i I	 0.68 	
ShC: Schattel	 70 	Slow water movement	11.00	movement Depth to bedrock	 0.94 0.26	
StA: Sinton	 80 	movement		I	 0.60 	
SxA: Sinton	 80 	Flooding			 1.00 	
TcA: Tiocano	 90 	Ponding Slow water movement	11.00	Ponding Depth to saturated zone	 1.00 1.00 1.00	
UsC: Ustarents	 70 	·	 1.00 	 Somewhat limited Too steep 	 0.08 	
W: Water WaB: Weesatche	İ	 Very limited	İ	 Not rated Not limited 	 	

Table 17.--Agricultural Disposal of Wastewater by Infitration and Treatment of Wastewater--Continued

Map symbol	 Pct.	 Rapid infiltrat:	Lon	 Slow rate treatment		
and soil name	of	of wastewater	<u>-</u>	of wastewater	<u>-</u>	
	map			1		
	unit			1		
		[1		
		Rating class and	Value	Rating class and	Value	
		limiting features		limiting features		
		[1	1	1	
				1		
WaC:				1		
Weesatche	I 70	Very limited		Somewhat limited		
		Slow water	1.00	Too steep	10.08	
		movement		1		
WeB:				1		
Weesatche	I 70	Very limited		Not limited		
		Slow water	1.00	1		
		movement				
				1		
	1	[1	1	1	

Table 18.--Source of Gravel and Sand

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The ratings given for the thickest layer are for the thickest layer above and excluding the bottom layer. The numbers in the value columns range from 0.00 to 0.99. The greater the value, the greater the likelihood that the bottom layer or thickest layer of the soil is a source of sand or gravel. See text for further explanation of ratings in this table.)

Map symbol	 Pct.	 Potential source	 Potential source of			
and soil name	of map unit	gravel 		sand		
	 	 Rating class 	Value	 Rating class 	Value	
AnC: Annarose	 70 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	 0.00 0.00	
BcA: Buchel	 85 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	10.00	
BfA: Buchel	90	 Poor Bottom layer Thickest layer	10.00	 Poor Bottom layer Thickest layer	10.00	
CaB: Campbellton	 70 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	10.00	
CaC: Campbellton	 70 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	10.00	
CeB: Choke	 70 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
CeC: Choke	 70 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	10.00	
CkA: Clareville	 70 	 Poor Bottom layer Thickest layer			10.00	
CkB: Clareville	 70 	 Poor Bottom layer Thickest layer	10.00		10.00	
CnA: Condido	 70 	 Poor Bottom layer Thickest layer	10.00	-	10.00	
CoB: Conquista	 85 	 Poor Bottom layer Thickest layer	10.00	•	 0.00 0.00	

Table 18.--Source of Gravel and Sand--Continued

and soil name	 Pct. of map unit	gravel	of	 Potential source of sand 		
	 	 Rating class	Value	 Rating class	Value	
CoG: Conquista	 85 	-	0.00	 Poor Bottom layer Thickest layer	1 1 1 0.00	
CtB: Cotulla	 70 	-		•	10.00	
CyA: Coy	 80 	-	0.00		10.00	
CyB: Coy	 75 	-	0.00	·	10.00	
DAM: Dam	 100 	 Not rated 	 	 Not rated 	 	
DnA: Danjer	 75 	-		 Poor Bottom layer Thickest layer	1 1 1 0.00	
DnB: Danjer	 70 	-	0.00	 Poor Bottom layer Thickest layer	10.00	
EcB: Ecleto	 85 		10.00		10.00	
EsA: Eloso	 70 			=	10.00	
EsB: Eloso	 70 	•	0.00	 Poor Bottom layer Thickest layer	10.00	
EvA: Esseville	 80 	-	0.00		10.00	
EvB: Esseville	 80 	-	0.00	=	10.00	

Table 18.--Source of Gravel and Sand--Continued

Map symbol and soil name	 Pct. of map unit	gravel 	Potential source of sand			
	 	 Rating class 	Value	 Rating class 	Value	
EvC: Esseville	 70 	•	0.00	· •	10.00	
ExC: Esseville	 75 	_		•	 0.00 0.00	
FaC: Fashing	 75 	•		•	10.00	
GoB: Goliad	 70 		10.00		10.00	
HnD: Hindes	 80 	_	0.00	· •	0.00	
ImA: Imogene	 75 	_	0.00	· •	0.00	
LaB: Lacoste	 70 	_	0.00	· •	0.00	
LpB: Laparita	 75 	•		· <u>-</u>	0.00	
LtA: Lattas	 85 	_	0.00		0.00	
LtB: Lattas	 75 	•			0.00	
MaD: Mata	 75 	-	0.00		1 1 1 0.00	
MoA: Monteola	 80 	 Poor Bottom layer Thickest layer 	0.00	· •	 0.00 0.00	

Table 18.--Source of Gravel and Sand--Continued

	 Pct. of map unit	gravel	 Potential source of sand 		
	 	 Rating class 	Value	 Rating class 	Value
MoB: Monteola	 75 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	 0.00 0.00
NuC: Nusil	 75 	 Poor Bottom layer Thickest layer		 Fair Bottom layer Thickest layer	 0.00 0.14
OdA: Odem	 70 	 Poor Bottom layer Thickest layer	0.00	 Poor Thickest layer Bottom layer	10.00
OmD: Olmos	 80 	 Fair Thickest layer Bottom layer	10.00	 Poor Bottom layer Thickest layer	10.00
PaB: Papalote	 80 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	10.00
PbA: Papalote	 70 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	10.00
PbB: Papalote	 70 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	10.00
PcB: Parrita	 75 	 Poor Bottom layer Thickest layer	0.00	 Poor Bottom layer Thickest layer	10.00
PkB: Pavelek	 70 	 Poor Bottom layer Thickest layer	10.00		10.00
PkC2: Pavelek, severely eroded	 70 	 - Poor Bottom layer Thickest layer	10.00	· -	10.00
PmC: Pernitas	 70 	 Poor Bottom layer Thickest layer	10.00	· <u>-</u>	10.00
PnB: Pernitas	 70 	 Poor Bottom layer Thickest layer 	10.00	· -	10.00

Table 18.--Source of Gravel and Sand--Continued

* *	 Pct. of map unit	gravel	of	 Potential source sand 	of
	 	 Rating class	Value	 Rating class 	Value
PtC: Pettus	 75 	-	0.00	•	1 1 1 0.00
PvC: Picosa	 75 	-	0.00	•	10.00
Px: Pits	90	 Not rated 	 	 Not rated 	
RhC: Rhymes	 75 	-	0.00	-	0.00
RoA: Rosenbrock	 75 	-	0.00	•	0.00
RoB: Rosenbrock	 70 	Bottom layer	0.00	•	10.00
RrA: Rosenbrock	 80 	-	10.00	•	10.00
SaD: Sancajo	 80 	=	10.00	•	10.00
SeD: Sarnosa	 80 			-	10.00
ShC: Schattel	 70 	-	10.00	·	10.00
StA: Sinton	 80 	=	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-	10.00
SxA: Sinton	 80 	-	 0.00 0.00	-	1 1 1 0.00
TcA: Tiocano	 90 	-	 0.00 0.00	-	10.00

Table 18.--Source of Gravel and Sand--Continued

± ±	 Pct. of map unit	gravel		Potential source of sand			
	 	 Rating class 	Value	 Rating class 	Value		
UsC: Ustarents	 70 	· <u>=</u>	•	 Fair Bottom layer Thickest layer	 0.00 0.03		
W: Water	 100 	 Not rated 	 	 Not rated 			
WaB: Weesatche	 70 	·		 Poor Bottom layer Thickest layer	 0.00 0.00		
WaC: Weesatche	 70 	·		 Poor Bottom layer Thickest layer	1 1 1 1 0 . 0 0 1 0 . 0 0		
WeB: Weesatche	 70 		 0.00 0.00		 0.00 0.00		

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.00 to 0.99. The smaller the value, the greater the limitation. See text for further explanation of ratings in this table.)

		reclamation mater:	Potential source of reclamation material 		 Potential source of roadfill 		Potential source of topsoil	
		 Rating class and limiting features 		=		-		
AnC: Annarose		 	 0.46			 Fair Carbonate content		
BcA: Buchel	 85 	Too clayey	0.68	Shrink-swell Low strength	0.00			
BfA: Buchel		Too clayey	0.00 0.68	Low strength	0.00	 Poor Too clayey Carbonate content Sodium content 		
CaB: Campbellton	 70 	Too clayey	0.00	Depth to bedrock	0.00	 Poor Too clayey Carbonate content 		
CaC: Campbellton	 70 	Too clayey Salinity	0.00	 Poor Low strength Shrink-swell Depth to bedrock	0.00		 0.00 0.50 0.97	
CeB: Choke	İ İ	Organic matter content low Carbonate content	l	Low strength Shrink-swell	 0.00 0.89	İ	 	
CeC: Choke	 70 	Too clayey		Depth to bedrock	0.00		 0.73 	
CkA: Clareville	 70 	Carbonate content			0.00		 0.56 0.97	
CkB: Clareville	 70 	Too clayey Carbonate content	0.00			 Poor Too clayey 	 0.00	

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

and soil name				 Potential source roadfill 	of	Potential source of topsoil	
	 			 Rating class and limiting features 			
CnA: Condido	 70 1 	Too clayey Carbonate content 	0.00 0.00	 Poor Depth to bedrock Depth to cemented pan Low strength	0.00 0.00	Depth to cemented pan	
CoB: Conquista	 85 	 Fair Sodium content 	•	 Good 	 		
CoG: Conquista	 85 	 Fair Sodium content 	•	 Poor Slope 	 0.00 	Rock fragments	 0.00 0.00 0.88
CtB: Cotulla	 70 	Too clayey Sodium content	0.00	Low strength	 0.00 0.00	Sodium content	 0.00 0.00 0.97
CyA: Coy	 80 	 Poor Too clayey 			 0.00 0.14		 0.00
СуВ:	 75 	 Poor Too clayey 	 0.00 		 0.00 0.12	 Poor Too clayey 	 0.00
DAM: Dam	 100 	 Not rated 	 	 Not rated 	 	 Not rated 	
DnA: Danjer	 75 	 Poor Too clayey 	 0.00 		 0.00 0.12	 Poor Too clayey 	 0.00
DnB: Danjer	 70 	 - Fair Too clayey 		_	 0.00 0.12		 0.47
EcB: Ecleto	85 85 			Low strength		Too clayey	 0.00 0.00 0.97

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	reclamation mater		 Potential source roadfill 	Potential source of topsoil		
 	 	=		 Rating class and limiting features 		-	
EsA: Eloso	 70 	Organic matter	0.00 0.18	 	0.00		 0.00 0.97
EsB: Eloso	 70 1 	Too clayey	0.00 0.18	İ	0.00	 Poor Too clayey Depth to bedrock 	 0.00 0.54
EvA: Esseville	 80 	Too clayey Sodium content	0.00	 - Poor Depth to bedrock Shrink-swell Low strength	0.00	Sodium content	 0.00 0.78 0.88
EvB: Esseville	 80 	Too clayey Sodium content	0.00	 Poor Depth to bedrock Shrink-swell Low strength	0.00	Sodium content	 0.00 0.00 0.00
EvC: Esseville	 70 	Too clayey Organic matter content low	0.00 0.18	Ī		Salinity 	 0.00 0.00
ExC: Esseville	 75 1 	 Poor Too clayey Sodium content	 	 Poor Depth to bedrock Shrink-swell	 0.00	 Poor Too clayey Salinity	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
FaC: Fashing	 75 	 Poor Droughty Depth to bedrock	0.00	İ		(dense layer)	 0.00 0.00
GoB: Goliad	 70 	 Poor Too clayey 	0.50 0.00 0.18	 Poor Depth to cemented pan		 Poor	0.44 0.00 0.94
	 	content low Droughty	10.29	I	İ	pan	

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	reclamation mater:	Potential source roadfill 	of	Potential source of topsoil		
	 			 Rating class and limiting features 			Value
HnD: Hindes	 80 	Carbonate content Organic matter content low		İ		 Poor Rock fragments Carbonate content Hard to reclaim (rock fragments)	 0.50
ImA: Imogene	 75 	Salinity	 0.00 0.88 0.88	İ	 0.87 	 Poor Sodium content	0.00
LaB: Lacoste	 70 	Droughty Depth to cemented pan	0.00 	Depth to cemented pan	0.00 I	pan Depth to bedrock 	
LpB: Laparita	 75 	Too clayey Salinity		Shrink-swell	0.00	Salinity	 0.00 0.00 0.78
LtA: Lattas	 85 	•	 0.00		 0.00 0.12		
LtB: Lattas	 75 	•	 0.00	Shrink-swell	 0.00 0.12		10.00
MaD: Mata	 75 	Organic matter content low	0.00 0.49	 Fair Depth to bedrock 		 Carbonate content	 0.00 0.80 0.90
MoA: Monteola	 80 	Organic matter content low			 0.00 0.00	 - Poor Too clayey - -	 0.00
MoB: Monteola	 75 	Too clayey	 0.00 0.99		 0.00 0.00	 Poor Too clayey 	 0.00

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

and soil name				Potential source of roadfill		Potential source of topsoil	
	 	-		Rating class and limiting features		-	
NuC: Nusil	 75 	Too sandy Wind erosion	 0.00 0.00 0.88		 	 Poor Too sandy 	 0.00
OdA: Odem	 70 	 Good 	 	 Good 	 	 Good 	
OmD: Olmos	 80 		0.00 0.00	Depth to cemented pan	0.00	 Poor Carbonate content Rock fragments Depth to cemented pan	0.00
PaB: Papalote	 80 	Wind erosion Organic matter content low	0.00	Shrink-swell	 0.00 0.89 		 0.33
PbA: Papalote	70 	Too clayey	0.00	·	 0.00 0.87		 0.00
PbB: Papalote	 70 	Too clayey	0.00		 0.00 0.89		 0.00
PcB: Parrita	 75 	 Depth to cemented pan	0.00 	 Poor Depth to bedrock Depth to cemented pan Low strength	0.00 	pan Too clayey 	 0.00
PkB: Pavelek	 70 	Carbonate content	0.00 	 Poor Depth to bedrock Depth to cemented	ĺ	pan	 0.00 0.00
PkC2: Pavelek, severely eroded	 70 	pan Droughty Poor	 0.00 	pan Low strength Poor Depth to bedrock	 0.00 0.00		 0.00

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Map symbol and soil name	Pct. of map unit	reclamation mater		Potential source of roadfill		Potential source of topsoil	
		=		 Rating class and limiting features		=	Value
PmC: Pernitas	 - 70 	· • •		Shrink-swell	0.00	·	 0.69
PnB: Pernitas	 - 70 	Organic matter content low Carbonate content	0.60 	 Shrink-swell	 0.00 0.87	 Fair Too clayey 	 0.69
PtC: Pettus	 - 75 	 Poor Carbonate content Organic matter content low Droughty 	0.00	ĺ	 	 Poor Carbonate content Rock fragments Hard to reclaim (rock fragments)	0.00 0.18
PvC: Picosa	 - 75 		0.00	=	 0.00	_	 0.00 0.72
Px: Pits	 - 90	 Not rated 	 	 Not rated 		 Not rated 	
RhC: Rhymes	 - 75 	Too sandy	 0.00 0.00 0.60	İ	 	 Poor Too sandy 	 0.00
RoA: Rosenbrock	 - 75 	•	0.00				 0.00
RoB: Rosenbrock	 - 70 	 Poor Too clayey Carbonate content	0.00	=		= =	 0.00
RrA: Rosenbrock	 - 80 		0.00			·	 0.00
SaD: Sancajo	 - 80 	Droughty	0.00 0.00	Depth to cemented pan	0.00	 Poor Carbonate content Rock fragments Depth to bedrock	0.00

Table 19.--Source of Reclamation Material, Roadfill, and Topsoil--Continued

Rating class and Value Rating class and Value Rating class and Value Rating class and Value Immitting features	and soil name				Potential source roadfill	of	Potential source topsoil	of
Sarnosa		 						
Schattel		80	•		 Good 	 		 0.68
Sinton		70 	Too clayey Organic matter content low	0.00 0.18	Low strength Shrink-swell	0.00 0.12	Too clayey Carbonate content	0.54
Sinton		 80			 Good 	 	 Good 	
Tiocano	Sinton	80	•		 Good 	 	 Good 	
Ustarents		90			Depth to saturated zone Shrink-swell	0.00 0.00	Too clayey Depth to	İ
Water		 70 	Organic matter		 Not rated 	 	 Good 	
WaC:		100	 Not rated 	 	 Not rated 	 	 Not rated 	
WaC: Weesatche		 70 	•	0.00	Shrink-swell		•	
Weesatche		70	Carbonate content Organic matter	 0.00	 Fair Shrink-swell		 Good 	
		 70 	Carbonate content Organic matter	0.00	Shrink-swell		•	

Table 20.--Ponds and Embankments

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

Map symbol and soil name	Pct. of map unit	İ	eas	Embankments, dikes levees 	, and	Aquifer-fed excavated pond 	ls
		 Rating class and limiting features 		 Rating class and limiting features 			
AnC: Annarose	 - 70 	 Somewhat limited Seepage Depth to bedrock	0.70	ĺ	 	 Very limited Depth to water 	1 1.00
BcA: Buchel	 - 85 	 Not limited 	 	 Very limited Hard to pack		 Very limited Depth to water	11.00
BfA: Buchel	 - 90 	 Not limited 	 	 Very limited Hard to pack	11.00	 Very limited Depth to water	11.00
CaB: Campbellton	 - 70 	 Somewhat limited Seepage Depth to bedrock	0.70	Salinity	0.12	 Very limited Depth to water 	11.00
CaC: Campbellton	 - 70 	 Somewhat limited Seepage Depth to bedrock	0.70	Salinity		 Very limited Depth to water	11.00
CeB: Choke	 - 70 			·	0.12	•	11.00
CeC: Choke	 - 70 	 Somewhat limited Seepage Depth to bedrock	0.70	Salinity	0.12	•	11.00
CkA: Clareville	 - 70 		 0.70		 	 Very limited Depth to water 	11.00
CkB: Clareville	 - 70 	•		 Somewhat limited Hard to pack 	1 10.38	 Very limited Depth to water	1 1.00
CnA: Condido	; - 70 	 Very limited Depth to cemented pan Seepage Depth to bedrock	1.00 0.70	 Hard to pack	 1.00 0.99	 Very limited Depth to water 	11.00
CoB: Conquista	 - 85 	 Somewhat limited Seepage	 0.03	 Somewhat limited Piping	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	 Very limited Depth to water	1 1.00
CoG: Conquista	 - 85 	Slope	 0.50 0.03	= =	 0.38	 Very limited Depth to water 	1 1.00

Table 20.--Ponds and Embankments--Continued

Map symbol and soil name	 Pct. of map unit	 	eas	 Embankments, dikes levees 	, and	Aquifer-fed excavated ponds		
	 	=		 Rating class and limiting features 		-		
CtB: Cotulla	 70 	 Not limited 	 	Hard to pack		•	1 1.00	
CyA: Coy	 80 	 Not limited 	 	 Very limited Hard to pack	 1.00	 Very limited Depth to water	1 1 1 1 1 1 1 1 1 1	
Coy	 75 	 Not limited 		 Very limited Hard to pack 	 1.00	 Very limited Depth to water 	1 1.00	
DAM: Dam	1100	 Not rated		 Not rated		 Not rated		
DnA: Danjer	 75 	 Not limited 	 	 Somewhat limited Hard to pack		 Very limited Depth to water	11.00	
DnB: Danjer	 70 	 Not limited 	 	 Somewhat limited Hard to pack		 Very limited Depth to water	11.00	
EcB: Ecleto	 85 		0.53	Thin layer	1 1.00		1.00	
EsA: Eloso	 70 	 Somewhat limited Seepage Depth to bedrock	0.70	ĺ	 	 Very limited Depth to water	11.00	
EsB: Eloso	 70 	 Somewhat limited Seepage Depth to bedrock	0.70			 Very limited Depth to water 	11.00	
EvA: Esseville	 80 	 Very limited Gypsum content Depth to bedrock	11.00	-		 Very limited Depth to water 	11.00	
EvB: Esseville	 80 		11.00	-	11.00	 Very limited Depth to water	11.00	
EvC: Esseville	 70 	-	11.00	· •		 Very limited Depth to water 	1.00	
ExC: Esseville	 75 	-	11.00	 Very limited Hard to pack Salinity		 Very limited Depth to water 	1 1.00	

Table 20.--Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	I	eas	Embankments, dikes levees 	, and	Aquifer-fed excavated pond 	ls
	 	 Rating class and limiting features 		Rating class and limiting features			
FaC: Fashing	 75 	Depth to bedrock	0.74	Thin layer		 Very limited Depth to water 	
GoB: Goliad	 - 70 		0.66 0.53	Thin layer 			11.00
HnD: Hindes	 - 80 			 Somewhat limited Large stones content			1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
ImA: Imogene	 - 75 	 Not limited 	 	Piping	1.00	-	11.00
LaB: Lacoste	 - 70 	 Very limited Depth to cemented pan Depth to bedrock Seepage	1.00 0.06	 	1 1.00	 Very limited Depth to water 	11.00
LpB: Laparita	 75 	 Somewhat limited Seepage Depth to bedrock 	0.03	Piping Salinity	 0.90 0.50 0.01	1	 1.00
LtA: Lattas	 - 85 	 Not limited 	 	 Very limited Hard to pack	1 1.00	 Very limited Depth to water	1 1.00
LtB: Lattas	 - 75 	 Not limited 	 	 Very limited Hard to pack	11.00	 Very limited Depth to water	11.00
MaD: Mata	 - 75 	 Somewhat limited Seepage Depth to bedrock	0.70	-	0.12	=	11.00
MoA: Monteola	 - 80 	 Not limited	 	 Very limited Hard to pack	1.00	 Very limited Depth to water	11.00
MoB: Monteola	 - 75 	 Not limited 	 	 Very limited Hard to pack	11.00	 Very limited Depth to water	11.00
NuC: Nusil	 - 75 	=	 1.00	 Somewhat limited Seepage 	0.14	 Very limited Depth to water 	11.00

Table 20.--Ponds and Embankments--Continued

Map symbol and soil name	Pct. of map unit	İ	eas	Embankments, dikes levees 	, and	Aquifer-fed excavated pond 	ls
	 	=		 Rating class and limiting features		-	
OdA: Odem	 70	 Verv limited	 	 Somewhat limited	 	 Verv limited	
		Seepage 		Seepage			11.00
OmD:	1		l	1			1
Olmos	80 	pan	1.00 	Thin layer 	11.00		11.00
		Seepage Depth to bedrock	0.70		0.40		
PaB: Papalote	 - 80 -	 Not limited 	 	 Not limited 		 Very limited Depth to water	11.00
PbA:	i		İ		i		i
Papalote	· 70 	Not limited 	 	Not limited 		Very limited Depth to water 	 1.00
PbB: Papalote	 - 70 - - -	 Not limited 	 	 Not limited 	 	 Very limited Depth to water 	 1.00
PcB:		I	I	I		I	1
Parrita	· 75 	Very limited Depth to cemented pan Seepage Depth to bedrock	1.00 0.70	Thin layer 		Very limited Depth to water 	 1.00
PkB:	i	İ	I	i İ	i	İ	i
Pavelek	· 70 	Very limited Depth to cemented pan		Very limited Thin layer 		Very limited Depth to water 	11.00
		Seepage Depth to bedrock		•	0.94 	 	
PkC2:	1	 	 			 	
Pavelek, severely	Ì	İ	l	i i	İ	İ	İ
eroded	70 	Depth to cemented pan				Very limited Depth to water 	11.00
		Seepage Depth to bedrock		Hard to pack	0.91	 	
PmC:		 	 			 	
Pernitas	· 70 		 0.70 	Not limited 		Very limited Depth to water 	 1.00
PnB: Pernitas	 - 70 -		 0.70 	 Not limited 	 	 Very limited Depth to water 	 1.00
PtC: Pettus	 		 1.00 	 Not limited 	 	 Very limited Depth to water 	 1.00
PvC: Picosa	 75 	Depth to bedrock		Salinity			11.00

Table 20.--Ponds and Embankments--Continued

and soil name	Pct. of map unit	İ		 Embankments, dikes levees 	, and	Aquifer-fed excavated pond 	ls
	 	 Rating class and limiting features 		 Rating class and limiting features 			
Px:		 	 	 	 	 	
Pits	90 	Somewhat limited Seepage				Not rated 	
RhC: Rhymes	 75 			 Somewhat limited Seepage		=	11.00
RoA: Rosenbrock	 75 			 Very limited Hard to pack 		 Very limited Depth to water 	1 1 1 1 1 1 1 1 1 1
RoB: Rosenbrock	 70 			 Very limited Hard to pack		 Very limited Depth to water	 1.00
RrA: Rosenbrock	 80 	 Not limited 		 Very limited Hard to pack		 Very limited Depth to water	11.00
SaD: Sancajo	 80 	Depth to cemented pan	1.00 	I	1.00 		11.00
	 	Seepage Depth to bedrock	ĺ	content	0.99 	 	
SeD: Sarnosa	 80 	 Very limited Seepage		 Not limited 	 	 Very limited Depth to water	1 1 1 . 00
ShC: Schattel	 70 		0.03	Hard to pack			11.00
StA: Sinton		 Somewhat limited Seepage					11.00
SxA: Sinton	 80 	=	 1.00	 Not limited 	 	 Very limited Depth to water 	11.00
TcA: Tiocano	 90 	 Not limited 	 	Depth to saturated zone	1.00 1.00	Ī	 1.00 0.10
UsC: Ustarents	 70 		 0.70	 Somewhat limited Seepage 		 Very limited Depth to water	1 1.00
W: Water	100	 Not rated	 	 Not rated	 	 Not rated	

Table 20.--Ponds and Embankments--Continued

Map symbol	Pct.	Pond reservoir ar	reas	Embankments, dikes	Embankments, dikes, and		
and soil name	of			levees		excavated pond	ds
	map	I		I		I	
	unit						
		Rating class and	Value	 Rating class and	Value	 Rating class and	Value
	1	limiting features	1	limiting features	1	limiting features	
WaB:	- i 	<u> </u>	i 	 	i 	 	i
Weesatche	- 70	Somewhat limited	1	Somewhat limited		Very limited	
		Seepage	10.70	Piping	0.01	Depth to water	1.00
WaC:			i			 	i
Weesatche	- 70	Somewhat limited		Somewhat limited		Very limited	
		Seepage	10.70	Piping	0.11	Depth to water	1.00
WeB:			i				
Weesatche	- 70	Somewhat limited		Somewhat limited		Very limited	
		Seepage	0.70	Piping	10.08	Depth to water	1.00
	1	I	I	I	1	I	I

Table 21.--Water Management

(The information in this table indicates the dominant soil condition but does not eliminate the need for onsite investigation. The numbers in the value columns range from 0.01 to 1.00. The larger the value, the greater the limitation. See text for further explanation of ratings in this table.)

				 Constructing terraco diversions	es and
		 Rating class and limiting features 			
AnC: Annarose			0.37		0.88
BcA: Buchel	85	 Not limited 		 Somewhat limited K factor	 0.88
BfA: Buchel	90	 Not limited 		 Somewhat limited K factor	 0.88
CaB: Campbellton	 70 			'	 0.88 0.04
CaC: Campbellton	 70 1				 0.88 0.37
CeB: Choke	 70 		0.04		 0.88 0.04
CeC: Choke	 70 		0.37	'	 0.88 0.37
CkA: Clareville	 70 	 Not limited 	 	 Somewhat limited K factor	 0.88
CkB: Clareville	 70 	•	0.04		 0.88 0.04
CnA: Condido	 70 	 Very limited Thin cemented pan Depth to soft bedrock 		Thin cemented pan	 1.00 1.00 0.65
CoB: Conquista	 85 	 Somewhat limited Slope 	 0.04	'	 0.88 0.04

Table 21.--Water Management--Continued

Map symbol and soil name				Constructing terraces and diversions 		
	 	Rating class and limiting features		 Rating class and limiting features 		
CoG: Conquista	- - 85 	 Very limited Slope 		•	1 1.00	
CtB: Cotulla	- 70 	 Somewhat limited Slope 			0.88	
CyA: Coy	 - 80 	 Not limited 	 	 Somewhat limited K factor 	10.88	
СуВ: Соу	 - 75 	 Somewhat limited Slope			0.88	
DAM: Dam	 - 100	 Not rated 	 	 Not rated 		
DnA: Danjer	 - 75 	 Not limited 	 	 Somewhat limited K factor	 0.88	
DnB: Danjer	 - 70 	 Somewhat limited Slope 			0.88	
EcB: Ecleto	 - 85 	Depth to soft bedrock	1.00 	 Very limited K factor Depth to soft	11.00	
	i 			bedrock Slope	0.04	
EsA: Eloso	 - 70 	 Somewhat limited Depth to soft bedrock	 0.03 	 Somewhat limited K factor 	 0.50	
	 	 	 	Depth to soft bedrock 	0.03	
EsB: Eloso	 - 70 	 Somewhat limited Depth to soft bedrock	 0.46	 Somewhat limited K factor	 0.50	
		Slope	0.04	Depth to soft bedrock Slope	0.46	
EvA: Esseville	 - 80 	 Somewhat limited Depth to soft bedrock	 0.03 	 Somewhat limited K factor Depth to soft bedrock	10.88	

Table 21.--Water Management--Continued

Map symbol and soil name	Pct. of map unit	waterways and surfa drains		 Constructing terrac diversions 	es and
	 	 Rating class and limiting features 		 Rating class and limiting features 	Value
EvB: Esseville	 80 	bedrock	 0.06 0.04		 0.88 0.06 0.04
EvC: Esseville	70 	bedrock	 0.71 0.37 	 Somewhat limited K factor Depth to soft bedrock Slope	 0.88 0.71 0.37
ExC: Esseville	 75 		 0.16 0.03 	Slope	 0.88 0.16 0.03
FaC: Fashing	 75 	bedrock	 1.00 0.37	bedrock K factor	 1.00 1.08 0.88 0.37
GoB: Goliad	 70 	 Somewhat limited Thin cemented pan Slope 			 0.88 0.06 0.04
HnD: Hindes	 80 	stones		 Very limited Content of large stones Slope 	 1.00 0.84
ImA: Imogene	 75 	 Not limited 	 	 Very limited K factor	1 1.00
LaB: Lacoste	 70 	Depth to soft bedrock	11.00	 Depth to soft bedrock	 1.00 0.88 0.20

Table 21.--Water Management--Continued

and soil name				Constructing terraces and diversions 		
	 			 Rating class and limiting features 		
LpB: Laparita	 75 				 0.88 0.04	
LtA: Lattas	 85 	 Not limited 	 	 Somewhat limited K factor	 0.88	
LtB: Lattas	 75 	 Somewhat limited Slope 		K factor	 0.88 0.04	
MaD: Mata	 75 			 Somewhat limited Slope	 0.37	
MoA: Monteola	 80 	 Not limited 	 	 Very limited K factor	 1.00	
MoB: Monteola	 75 			K factor	 1.00 0.04	
NuC: Nusil	 75 			· •	 1.00 0.16	
OdA: Odem	 70 	 Not limited 	 	 Somewhat limited K factor	 0.12	
OmD: Olmos		Thin cemented pan Content of large stones Slope 	11.00			
PaB: Papalote	 80 	 Somewhat limited Slope 	 0.04 	•	 0.88 0.04	
PbA: Papalote	 70 	 Not limited 	 	 - Somewhat limited K factor	 0.88	
PbB: Papalote	 70 	 Somewhat limited Slope 	 0.04 	•	 0.88 0.04	

Table 21.--Water Management--Continued

and soil name				 Constructing terrace diversions	es and
	 	=		Rating class and limiting features	
PcB: Parrita	 75 	Depth to soft bedrock	1.00 0.65 	Thin cemented pan Depth to soft bedrock K factor	
PkB: Pavelek	 70 1 	Thin cemented pan Depth to soft bedrock	1.00 0.90 	 Very limited K factor Thin cemented pan Depth to soft bedrock	 1.00 1.00 0.90 0.04
PkC2: Pavelek, severely eroded	 70 1 	Depth to soft bedrock Thin cemented pan	1.00 	 Depth to soft bedrock Thin cemented pan	 1.00 1.00 1.00 0.37
PmC: Pernitas	 70 	 Somewhat limited Slope 			 0.88 0.37
PnB: Pernitas	 70 	 Somewhat limited Slope 	 0.04 	•	 0.88 0.04
PtC: Pettus	 75 	 Somewhat limited Content of large stones Slope 		Content of large stones Slope	0.38 0.37 0.12
PvC: Picosa	 75 	bedrock Content of large stones	1.00 	bedrock Content of large stones K factor	 1.00 1.00 1.00 0.50 0.16
Px: Pits	 90 	 Not rated 	 	 Not rated 	

Table 21.--Water Management--Continued

				 Constructing terrac diversions 	es and
	 	 Rating class and limiting features 		 Rating class and limiting features 	
RhC: Rhymes	 75 			•	 1.00 0.16
RoA: Rosenbrock	 75 	 Not limited 		 Somewhat limited K factor	 0.12
RoB: Rosenbrock	 70 				0.12
RrA: Rosenbrock	 80 	 Not limited 	 	 Somewhat limited K factor	0.12
SaD: Sancajo	 80 	Content of large stones Depth to soft	1.00 	K factor Depth to soft	 1.00 1.00
	 	Thin cemented pan	11.00	Thin cemented pan Content of large stones	
SeD: Sarnosa	 80 		 0.84	Slope	 0.84 0.12
ShC: Schattel	70 	Slope	0.37	•	 0.88 0.37
StA: Sinton	 80 	 Not limited 		 Somewhat limited K factor 	 0.50
SxA: Sinton	 80 	 Not limited 	 	 Somewhat limited K factor	 0.50
TcA: Tiocano	 90 	 Not limited 	l	Depth to saturated zone	 1.00 1.00 0.88

Table 21.--Water Management--Continued

± ±	 Pct. of map unit	waterways and surfa drains		 Constructing terrac diversions 	es and
	 	Rating class and limiting features 		Rating class and limiting features	Value
UsC: Ustarents		 Somewhat limited Slope 	 0.37	 Somewhat limited Slope K factor	 0.37 0.12
W: Water	 100	 Not rated	' 	 Not rated	
WaB: Weesatche	 70 		 0.04 	 Somewhat limited K factor Slope	0.88
WaC: Weesatche	 70 	 Somewhat limited Slope		 Somewhat limited K factor Slope	0.88
	 	 Rating class and limiting features		 Rating class and limiting features	Value
WeB: Weesatche	 70 	 Somewhat limited Slope 	 0.04 	 Somewhat limited K factor Slope 	 0.88 0.04

Table 22.--Engineering Index Properties

(Absence of an entry indicates that the data were not estimated.)

ן מ ב ב ב	ticit		7-13	9-18	NP-11	32-48	32-48	32-48	111-20 120-30 120-30 111-22	111-20 125-35 120-30 111-22
		Pct		 30-40 	121-30	 55-75 55-75	55-75 55-75 	 55-75 55-75 	30 40 10 10 10 10 10 10 1	
ρι	200		40-65	45-60	25-50	L L	175-95	75-95	60 - 80 70 - 90 70 - 90 60 - 80	60 - 80 69 - 82 70 - 90 60 - 80
age passin	4 0		90-100	80-100	65-80	00	90-100	90-100	8 8 8 0 1 9 8 8 8 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	80 - 95 - 80 - 95 - 80 - 95 - 98 - 98 - 98 - 98 - 98 - 95 - 95
Percentage			90-100	90-100	90-100	95-100 95-100	95-100 95-100	95-100	95-100 95-100 95-100 95-100	95-100 100 95-100 95-100
Per	\d_4 0 \		95-100	95-100	95-100		95-100 95-100	95-100	98-100 98-100 98-100 98-100	98-100 100 98-100 98-100
ents	3-10 inches	Pct	00	0	0	0 0	0 0	00	0000	0000
Fragment	>10 inches	Pct	00	0	0	00	00	00	0000	0000
ication	AASHTO		A-4, A-6 A-4, A-6	A-4, A-6	A-2-4, A-4,	A-7-6 A-7-6	A-7-6 A-7-6	A-7-6 A-7-6	A-6 A-7-6 A-7-6 A-6, A-7-6	A-6 A-7-6 A-7-6 A-6, A-7-6
Classif	Unified		SC, SC-SM SC, SC-SM	CL, SC, SM	SC, SC-SM, SM	СН	CH CH	СН	CL CH, CL CL, CL	CL CH CH, CL CL
ACSI)		Fine sandy loam Sandy clay Sloam, fine sandy loam,	loam Fine sandy loam, loam, sandy clay	andy loamy sand	silty	Clay Clay, clay, clay	Clay Clay, silty (clay	Clay loam Clay Clay clay Clay, clay Cl	Clay loam Clay Clay clay clay clay clay clay loam Clay, clay loam loam, loam
ب ب ب ب) 7	In	0 - 9 - 25	25-50	50-80	0 - 8 - 42	42-74	0-14	0 - 7 7 - 34 34 - 43 43 - 80	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
- Codmys ceM	and soil name		Anc: Annarose			BcA: Buchel		Bichel	CaB: Campbellton	CaC: Campbellton

Table 22. -- Engineering Index Properties -- Continued

Map symbol	Depth	USDA texture	Classif	sification	Fragments	ents	Percentage	age passing	Lignid	— — — С
and soil name) H				>10	3-10				tici.
			Unified 	AASHTO 	inches	inches	10	40 20	 00	index
	In				Pct	Pct			Pct	
Choke	0-10 10-24	등등	CH, CL	A-6, A-7-6 A-7-6, A-6	00	0 0 1 1	 98-100 95-100 98-100 95-100	85-100 60 85-100 60	-95 38-56 -90 38-56	1 9 - 3 3 - 1 9 - 3 3
	24-34 34-48	silt loam, silt loam	CH, CL	A-6, A-7-6 A-6, A-7-6	00	0 - 1	98-100 95-100	85-100 85-100	60-90 38-56 60-90 38-56	
	48-73	ciay loam Loam Silt loam, loam	CL	A-6 A-6, A-7-6	00	0 - 1	 98-100 95-1 95-100 90-1	95-100 85-100 60- 90-100 85-100 60-	60-90 30-49 60-90 30-49	115-28
Choke	0-11 11-61	Silty clay loam Silty clay loam, loam, loam,	CH, CL CH, CL	A-6, A-7-6 A-6, A-7-6	00	0 - 1	 98-100 95-1 98-100 95-1	-100 85-100 60-	60-95 38-56 60-90 38-56	1 0 1 3 3 1 1 0 1 3 3 1 1 0 1 1 0 1 1 0 1 1 0 1 1 1 0 1
	61-80	silt loam Silt loam, loam		A-6, A-7-6	0	0-1	98-100 95-1	00 85-100 60	-90 30-49	115-28
Cka: Clareville	0-12	Sandy clay loam Sandy clay, clay loam,	CL, SC	A-6, A-7-6 A-6, A-7-6	00	0 0	98-100 95-1 98-100 95-1	5-100 90-100 45- 5-100 90-100 51-	45-70 32-48 51-80 46-60	15-27 25-37
	21-59		CH, CL	 A-6, A-7-6 	0	0	 98-100 95-1 	00 90-100 51	-80 36-52 	117-30
	59-80	l loam, clay Sandy clay loam, clay loam, loam	CH, CL	 A-6, A-7-6 	0	0	95-100 85-1	00 85-100 51	-75 36-52	 17-30 -
CkB: Clareville	0-11 11-45	Sandy clay loam Clay loam, clay, sandy	CL, SC	A-6, A-7-6 A-7-6	00	0 0	98-100 95-1 98-100 95-1	5-100 90-100 45- 5-100 90-100 51-	-70 32-48 -80 46-60	115-27
	45-70		CH, CL	A-6 	0	0	 98-100 95-1 	00 90-100 51 	-80 36-52 -80 36-52	117-30
	70-80	l loam, clay Sandy clay loam, clay loam, loam	CH, CL	A-6, A-7-6	0	0	95-100 85-1 91-100 85-1	00 85-100 51	-75 36-52	 17-30
_		_	_	_	_		_	_	_	_

Table 22.--Engineering Index Properties--Continued

Map symbol	Depth	 USDA texture	Classif	Classification	Fragn	Fragments	Per	Percentage Sieve nur	ige passing	رة ا	Lignid	Plas-
and soil name	4		Unified	AASHTO	>10 inches	3-10 inches	4		40	200	limit	ticity index
	uI				Pct	Pct					Pct	
CnA: Condido	0-13 13-16 16-28	Clay Gravelly clay Cemented	СН	A-7-6 A-7-6	0 0 0	0 - 30	100	100	95-100	80-90	56-71	33-45 33-45
	28-80	material Silt loam, loam	 CL, CL-ML 	A-4, A-6	0-10	0-30	100	98-100	85-95	70-80	20-30	5-12
Conquista	0-13	Clay Stratified fine sandy loam to gravelly loam to gravelly sandy clay	CH CL, CL-ML, GC, SC-SM	A-7-6 A-2-4, A-4, A-6	00	0 - 0	95-100	95-100 50-90	40-80	30-70	21-32	33-45 6-12
CoG: Conquista	0 - 18 18 - 80	Clay Stratified fine sandy loam to gravelly loam to gravelly sandy clay	CH CL, CL-ML, GC, SC-SM	A-7-6 A-2-4, A-4, A-6	00	0 - 0	95-100	50-90	85-100	65-85 30-70 1	56-71 21-32	33-45 6-12
CtB: Cotulla	0-7 7-12 12-18 18-34 52-80			A - 7 - 6 A - 7 - 6 A - 7 - 6 A - 7 - 6 A - 7 - 6 A - 7 - 6	000000	000000	80-100 80-100 80-100 80-100 80-100	75-1001 75-1001 75-1001 75-1001 75-1001	75-100 75-100 75-100 75-100 75-100	75-100 75-100 75-100 75-100 75-100	51-70 51-70 51-70 51-70 51-70	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2
CyA: Coy	0-111 11-50 50-62 62-80	Clay loam Clay, clay loam, sandy clay Clay Clay Clay clay clay clay clay	CH, CL CH, CL CH, CL CH, CL	A-6, A-7-6 A-7-6 A-7-6 A-7-6 A-7-6	00 00	00 00	98 8 8 8 8 8 8 8 9 8 9 9 9 9 9 9 9 9 9	97-100 9 97-100 9 97-100 9 97-100 9	95-100 95-100 95-100		35 - 42 - 62 - 40 - 60 - 60 - 60 - 60 - 60 - 60 - 60	18-30 27-42 27-42 27-42 25-40

Table 22.--Engineering Index Properties--Continued

Map symbol	Depth	USDA texture	Classif	assification	Fragr	Fragments	Pe l	Percentage sieve nun	age passing number	ıg	Liquid	Plas-
and soil name	1		Unified	AASHTO	>10 inches	3-10 inches	4		40	200	limit	ticity index
	uI				Pct	Pct					Pct	
Coy	0-6	0.0	CH, CL	A-6, A-7-6 A-7-6	000	000	98-100	97-100	95-100	70-85	135-55	18-30
) 	Loam, sandy	- CE	0 / 	> 	> 	⊣ I	ນ ກ	00 H C C C C C C C C C C C C C C C C C C	I >	1 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1 1'
	37-61 61-80	clay Clay, silty clay,	CH CH, CL	A-7-6 A-7-6	00	00	98-100	97 - 100 95 97 - 100 95	95-100 70 95-100 70	70-90	42-62	27-42 25-40
DAM: Dams												
DnA: Danjer	0-10 10-52 52-80	Clay loam Clay, clay loam Clay loam, clay	CH, CL CH CL, CH	A-7-6 A-7-6 A-7-6	000	000	90-100	90-100 9 95-100 9 90-100 9	90-100	60-90 70-95 60-90	45-62 52-70 45-62	25-41 30-45 25-41
DnB: Danjer	0-15 15-27 27-45 45-71	Clay clay loam Clay Clay	CH CL CH CL	A-7-6 A-7-6 A-7-6 A-7-6	00000	00000	90-100	900100000000000000000000000000000000000	00-100-100-100-100-100-100-100-100-100-	700-90 70-90 70-95	45-62 52-70 52-70 52-70	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
Ecleto	0 - 5 - 0 - 5 - 0 - 0 - 0 - 0 - 0 - 0 -	clay lo sandy		-6,	00	00	000	5-10	85-1001	3 6 6 6 7 6 9 6 9 9 9 9 9 9 9 9 9 9 9 9 9	344 02	r 64
	18-80	loam Bedrock 					 	 	 ! !	-	 ! !	
Esa: Eloso	0-14 14-33 33-37	 Clay Clay Silty clay loam, clay	Ст. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С. Н. С	A-7-6 A-7-6 A-7-6, A-6	000	000	1000	100 95-100 95-100	95-100 95-100 90-99	75-85 75-95 70-80	26 - 66 - 56 - 56 - 56 - 56 - 56 - 56 -	33-41 33-41 19-33
	37-80	loam Silt loam, loam	_ CI CI		0	0	100	95-100	85-95	70-80	120-30	5-12
ESB: Eloso	0-18 18-30 30-80	Clay Clay Silt loam, loam	СТ ::	A-7-6 A-7-6 A-4, A-6	000	000	100	100	95-100 85-95	75-85 75-95 70-80	56-66 20-30	33-41 33-41 5-12

Table 22.--Engineering Index Properties--Continued

Map Symbol	Depth	USDA texture	Classification	ication	Fragments	ents	Per	centa	ige passing		Lignid	Д 6 8
and soil name	; ;	1	11n:-F:-	 	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \	3-10	4	0	404	000	limit	ticity
			D	OTHERW		TILCITES	r		 r	0	_	FIICUS
ζ	uI				Pct	Pct			-	 	Pct	
Esseville	0-13	Clay	CH	A-7-6	0	0-3	98-100	95-100	80-100 7	5-90	51-75	30-50
_	13-37	IClay	CH	A-7-6	0	0-3	0-1001	-1001	75-100	5-98	56-80	33-54
_	37-55	Gypsiferous	СН	A-7-6	0	0-3	-1001	80-1001	75-100 7	5-98	26-80	3-5
	55-80	clay Clay	- CH	A-7-6	0	0-3	90-100	80-100	75-100 7	5-98	26-80	33-54
EVB:												
Esseville	0-5	Clay	CH	A-7-6	0	0-3	98-100	-1001	-1001	2-90	51-75	0-5
	5-18	IClay	-CH	A-7-6	- ·	1	Π,	80-100	-1001	5-98	9 - 9	٦ ص
	18-36 36-80	Clay Gypsiferous	5 5 -	A-7-6 A-7-6	· ·	0 - 3	90-100	80-1001	75-100 7 75-100 7		76-80 56-80	33-54 33-54
		clay 										
EvC: Esseville	9-0	 Clay		 A-7-6	 0	- 1	 98-100	95-100	80-100 7	1 06-5	1-7	-5
_	6-27		CH	A-7-6	0		0-1001	-1001		5-98	9-9	3
	27-44	Gypsiferous clav	CH -	A-7-6 	 0	0-3	90-100	80-100	75-100 7	 86 - 5	- 26-80 -	33-54
	44-80	Gypsiferous clay	СН	A-7-6	0	0-3	90-100	80-100	75-100 7	5-98	56-80	33-54
ExC:												
Esseville	8-0	Gravelly clay	CH	IA-7-6	0-1	0-10	5-80	55-80	155-80 150-75	_	50-80	15
	8-17	Clay	HO-	A-7-6	 	0 0	5-100	90-100 8	80-100 7		50-80	32-55
_	νη Γα 1 α Ι Γα	CIAY Gimsi ferons	5-	A = / = 6 A = 7 = 6		o c		901100	001100 0110017			U I
		3	5	0 1 4 =	 	>		 0)
FaC:	,			ı		,	,	;			,	
rasnıng	13-80	ciay ioam Stratified clay	5 5 ₋	A-7-6 A-7-6	 	00	98-100	96-1001 96-1001	95-100 80-100		- 20 - 06 - 50 - 66	29-41 29-41
GoB:												
Goliad	0-10	Fine sandy loam	SC, SC-SM,	4-	0 0	0 (100	00	70-100 3	6-50	16-30	NP-10
	10-15		CL, SC	A-/-6 	 	0	 0 0	00T-06	Ω	- 0/-9	4 L L 4 8 L L 4 8 L L L 4 8 L L L 4 8 L L L 4 8 L L L L	97-07
		clay, clay										
	15-36	Sandy clay,	CH, CL	A-7-6	0	0	95-100	85-100	80-100 5	51-80	45-57	22-32
		Clay, clay loam										
	36-80	Cemented material			 		 				 ! !	
_		_	_	_	_		_	_	_	_	_	

Table 22. -- Engineering Index Properties -- Continued

	ъ.ч	Pct	123-40 8-20	41-52 16-26	41-52 16-26	123-43 8-20	 23-43 8-20 		26-48 11-24	126-43 11-25] ()	26-37 11-21	26-37 16-25
ing	1 200		130-50	115-45	115-45	30-75	30-75	 40-70	145-75	 40-70 	140-70) 	30 - 45
pass nber-	40		35-50	20-45	120-45	135-75	135-75	1 70-95	80-100	175-95	175-95		
Percentage pass sieve number-	10		35-50	20-50	120-50	150-90	150-90	95-100	95-100	90-100	85-100		80-100 80-100
Pe -	4		35-95	120-70	120-70	150-95	 50-95 	100	100	 95-100 	90-100		 - 80-100 -
Fragments	3-10 inches	Pct	0-20	115-90	15-60	15-60	 10-20 	0	0	0	0		 0 - 5
Fragi	>10 inches	Pct	0	0-10	0-10	0-10	0-10	0	0	0	0		0
Classification	 AASHTO		A-2-6, A-4, A-6	A-2-7, A-7-6	A-2-7, A-7-6	A-2-4, A-4,	 A-2-4, A-6 	 A-6, A-4	A-6, A-7-6	A-6, A-7-6	A-6		A-2-4, A-4
Classif	Unified		. sc	. sc	 	CI, GC, SC	GC, CL	CL, CL-ML,	02	CI, SC	CL, SC		SC-SM, SM,
 USDA texture			Very gravelly sandy clay	Extremely Extremely clay, very gravelly clay loam, very dravelly			loam, loam Gravelly clay loam	 Fine sandy loam	O	loam, sandy clay Sandy clay loam, clay	Sandy clay loam, loam, clay loam		
Depth	4	In	0-10	10-19	19-22	22-27	27-80	8 - 0	8-15	15-36	36-80		0 – 4
Map symbol	and soil name		HnD: Hindes		- — -			ImA: Imogene				=	LaB: Lacoste

Table 22.--Engineering Index Properties--Continued

Map symbol	Depth	USDA texture	Classif	Classification	Fragr	Fragments	Pe	Percentage sieve nur	ige passing	ng	Liguid	Plas-
and soil name		- — — -	Unified	AASHTO	>10 inches	3-10 inches	4		40	1 200	limit Limit	ticity index
	uI				Pct	Pct					Pct	
LpB: Laparita	0 - 6 - 42	 Sandy clay loam Clay, clay loam, sandy	 CH, CL 	 A-4, A-6 A-7-6	00	0 0	98-100	95-100 95-100	80-95 85-95	50 - 80 60 - 90	25-40 41-55	8-20
	42-61	clay Sandy clay loam, clay	CH, CL, SC	A-6, A-7-6	0	0	98-100	95-100	80-95	- 22-80		18-28
	61-80		CL-ML, CL	A-4, A-6	0	0	98-100	95-100	85-95	170-80	20-30	5-12
LtA: Lattas	0-14	Clay, Silty clay, clay,	СН, СL, SC СН		00	00	100	95-100	85-100	45-85 64-90	41-65 51-72	25-46 33-51
	45-80	lclay, silty clay, clay loam	СН	A-7-6	0	0	100	90-100	8	-100 64-90	151-72	33-51
LtB: Lattas	0-22	Clay Clay, silty clay, clay	CH, CL, SC	A-7-6 A-7-6	00	00	100	95-100	85-100	45-85 64-90	41-65 51-72	25-46 33-51
	55-80	loam Clay, silty clay, clay loam	НОН	A-7-6	0	0	100	90-100	85-100		51-72	33-51
MaD: Mata	0 - 5	 Gravelly clay	CL, GC, SC	A-2-4, A-2-6,	0	0 - 5			45-75	25-55	120-30	7-15
	5-31	Very gravelly clay loam, extremely gravelly clay	GC, GP-GC,	A-2-6, A-6	0	0-10	25-75	15-65	15-60	10-45	30-40	11-20
	31-44	gravelly sandy clay loam lGravelly clay loam loam loam	', - CL, SC	A-6	0	0-10	50-95	35-80	30-70	26-56	30-40	11-20
	44-80	Bedrock 						 	 		 	

Table 22.--Engineering Index Properties--Continued

Map symbol	Depth	 USDA texture	Classification	cation	Fragments	lents	Per	Percentage sieve nur	ige passing number		Liquid	Plas-
and soil name	,	· — — —	Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200	limit	ticity index
	u H				Pct	Pct					Pct	
MoA: Monteola	9	, , , ,	E	7 - A	 c	% I	98-100	95-1001	001-08			30150
	6-24	Clay	CH	- 1	0	0 - 0	90-100	80-100	75-100	5-96	56-80	l M
_	24-54	Clay	CH	A-7-6	0	0-3	90-100	80-100	75-10017	_	56-80	33-54
	54-80	Clay	СН	A-7-6	0	- 1	90-100	80-100	75-100 7		56-80	5
Monteola	0-17	Clav	CH	A-7-6	0	- 1	98-100	95-100	80-10017		51-75	30-50
5	17-54	Clay	- CH	A-7-6	0	- 1		80-100	75-100 7	5-96	56-80	33-54
	54-70	Clay	CH	A-7-6	00	0-3	90-1001	80-100		75-96	56-80	33-54
)	7 3 4 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5))		1)))
NuC: Nusil	0 0	רבי ע מריים מריים מריים	WS	2-C-4		C	00			ا 1 کا 1 کا	0-14	NP-3
1	29-37	0 0	SM	A-2-4	0	0	100	100	50-80	5-35	-22	NP-3
		loamy fine sand										
_	37-54	U	CI, SC	A-4, A-2-6,	0	0	100	100	06-08	35-55	25-38	8-15
				A-6								
	7.4 - 7.0	Salidy Loain	. T.	9-C-8	_	<u> </u>	100	100	- 00 - 00	2 1 7 7		α 1 1
	,	loam, fine		A-6	 >	o)) H			- —)))	H
_					_		_	_	_	_		
	70-80	Sandy clay loam, fine	CI, SC	A-2, A-4, A-6	0	0	100	100	70-90	30-55	20-35	8-15
					- — -			- — -				
oda:												
Odem	0-24	Fine sandy loam	SC-SM, SM	A-2-4	0 0	00	100	100	90-100 20-30		16-25	NP-7
_	1) -		 J	 >	o)) H)	1
	39-80	andy	loam SC-SM, SM	A-2-4	0	0	100	98-100	90-100 20-30		16-25	NP-7
OmD:	c		7		 7				L		c	7
sowTO	χ 	very gravelly sandv loam	GC, GC-GM,	A-Z-4, A-4	01-0	0-30	30-75	75-55	70-55	05-0T	08-8T	4-1-8
_	8-18	е1у	I, GP-GC,	A-2-4, A-2-6,	0-10	0-30	25-75	20-55	15-55 1	10-50	18-43	4-18
		gravelly sandy	U -	A-4								
	18-30								 !	 ! !	 	
	,				_		_	_	_	_	_	
_	30-80	Cemented material				 		 ! !			- ! !	
							_				_	

Table 22.--Engineering Index Properties--Continued

Map symbol	Depth	USDA texture	Classif	Classification	Fragments	ents	Percentage sieve nur	cage passing	ng	 Liquid	Plas-
and soil name	1		Unified	AASHTO	>10 inches	3-10 inches	4 - 10	0 40	1 200	limit	ticity index
	uI				Pct	Pct				Pct	
PaB: Papalote	0-12	Loamv fine sand	SC-SM, SM	 A-2-4, A-4	0	0	95-100190-100		120-50	16-25	NP-6
))))))	12-17 17-36	clay	SC, CH		000	000	5-100	100 90-100	155-75	141-61	21-36 18-31
		l loam, clay,					. — — 	· — —			
	36-60	Sandy clay loam, clav	CL, SC	A-6, A-7-6	0	0	95-100 80-100	100 75-96	36-70	35-49	18-31
	08-09	Sandy clay loam	SC, CL	A-6, A-7-6	0	0	95-100 80-100	100 75-95	136-70	35-49	18-31
PbA:							 				
Papalote	0 - 8	Fine sandy loam 	CL-ML, SC, SC-SM, SM	A-4 	0	0	95-100 95-100	1001-06 001	140-60	116-25	NP-8
	8-25			A-7-6	0	0	95-100 90-100	100 85-100	143-70	141-61	21-36
		Clay, Clay loam					 				
	25-66	Sandy clay	CL, SC	A-6, A-7-6	0	0	95-100 80-100	100 75-96	36-70	35-49	18-31
							· — —				
	08-99	Sandy clay loam	SC, CL	A-6, A-7-6	0	0	95-100 80-100	100 75-96	136-70	35-49	16-30
PbB:											
Papalote	0-11	Fine sandy loam	CL-ML, SC,	A-4 	0	0	95-100 95-100	100 90-100	140-60	116-25	NP-8
	11-27	Sandy clay,		A-7-6	0	0	95-100 90-1	1-100 85-100	143-70	41-61	21-36
		Ciay, Ciay loam					 				
	27-59	Sandy clay	CL, SC	A-6, A-7-6	0	0	95-100 80-1 	100 75-96	36-70	135-49	18-31
							· — —	· — —	. — —		
	59-80	Sandy clay loam	sc, cr	A-6, A-7-6	0	0	95-100 80-100 75-96	96-57 001	36-70	35-49	18-31
_				_	_	_	_	_	_	_	

Table 22.--Engineering Index Properties--Continued

Map symbol	Depth	USDA texture	Classif	Classification	Fragments	lents	Per	Percentage sieve nur	ige passing number		Liquid	Plas-
and soil name			Unified	AASHTO	>10 inches	3-10 inches	4	10	40	200	limit	ticity index
0 0	ц Н				Pct	Pct					Pct	
FCD. Parrita	0-5	Fine sandy loam	CL, CL-ML,	A-2, A-4, A-6	0	0	100	100	80-100 3	31-55	26-35	7-15
_	5-11	Sandy clay		A-6, A-7-6	0	0	100	100	80-100 5	51-60	38-55	17-30
		loam, sandy clay, clay										
	11-19	O	CH, CL	A-7-6	0	0	100	100	80-100 5	52-75	41-59	22-34
	19-28	cray Cemented									 	
		material			_		_		_	_		
	28-80	Gravelly sandy	SC, CI	A-2-6, A-6	 0	0-2	75-98	70-95	60-85 2	20-40	25-35	10-18
_								_				
- -		samay cray loam, gravelly		- -				_				
		loam										
PkB:								_	- —			
Pavelek	9 - 0	Clay loam	-CH	A-7-6	0 0	0 (95-100	75-100	75-100		56-66	33-41
_	12-16	Clay Grave v clav.	ICH. GC. SC	A = / = 6 A = 7 = 6	 - c	o c	95-100 65-75	00T-6/	75-65 55-65	45-55	.51 100 100 100	33-41 29-41
		113					 !					
_	16-24	Cemented				1		 	 !			
		ial	_		_		_		_	_	_	
	24-80	Silt loam, loam	CL, CL-ML	A-4, A-6	0	0	100	98-100	85-95 7	08-0	20-30	5-12
PkC2:												
severely eroded	0-4			A-7-6	0	0	95-100	75-100	75-100	08-0	9	33-41
	4-11	Clay, gravelly	CH, GC, SC	A-7-6	0	0	95-100	75-100	55-65 4	5-55	51-66	29-41
_	11-14	Can ted				!	 -	 				
		ial			_ (_	-	1
_	14-80	Silt loam, loam CL,	CL, CL-ML 	A-4, A-6	0	0	100	98-100	85-95	70-80	20-30	5-12

Table 22.--Engineering Index Properties--Continued

Plas-	±		4-15	16-33	18-32	118-32	112-25	9-20	118-32	117-32	117-27	117-27	11-21	10 - 18
Liquid	llimit -	Pct	120-30	33-57	130-55	135-50	125-40	124-37	130-55	135-50	135-50	35-50	27 - 43 25 - 35	25 - 35
ng	200		30-40	53-75	145-70	145-70	140-67	36-55 53-75	145-70	145-70	145-70	140-67	140-65	2 e - 5 e
e passing umber	40		95-100	86-06	66 - 08	86-08	86-09-	95-100 36-5 90-98 53-7	66-08	66-08	66-08	86-091	55-92 15-70	30-70
Percentage pass sieve number-	10		100	96-100	66-06-	66-06	170-99	100 100 8-100 96-100	66-06	66-06	66-06	170-99	75-95 20-75	35-80
Б Б Б	4		100	98-100	90-100	90-100 90-100	75-100	100 98-100	90-100	 90-100 	90-100	75-100	80-100 30-80	- 5 - 0 - 9 5
Fragments	3-10 inches	Pct	0	0	0	0 0	0	00	0	0	0	0	0 - 5 0	0-10
Fragi	>10 inches	Pct	0	0	0	00	0	00	0	0	0	0	0	0
cation	AASHTO		A-2-4, A-2-6,	A-4 A-6, A-7-6	A-6, A-7-6	A-7, A-7-6 A-6, A-7-6	A-6	A-4, A-6 A-6, A-7-6	A-6, A-7-6	A-6, A-7-6	A-6, A-7-6	A-6	A-6, A-7-6 A-2-6, A-6	A-2-6, A-6
Classification	Unified		SC, SC-SM	CH, CL	CH, CL, SC	SC, CL SC, CL	SC, CL	CL, SC CH, CL	CH, CL, SC	SC, CL	CI, SC	CL	CL, SC CL, SC	CI, GC, SC
USDA texture	· — — —		Fine sandy loam	clay	clay clay sandy	clay oam,	sandy clay Loam, sandy clay loam	Sandy clay loam Sandy clay Sandy clay Sandy clay Soam So	clay clay	loam Sandy clay, S	loam,	Sandy Clay Loam	Sandy clay loam	ndy '' ine '' ine '' im', '' in', ''
Depth	ı	uI	7-0	7-20	20-26	26-35 35-58	58-80	0-7	14-26	26-36	36-59	59-80	0-11 11-54	54-80
Map symbol	and soil name		PmC: Pernitas					PnB: Pernitas					PtC: Pettus	

Table 22. -- Engineering Index Properties -- Continued

id Plas-			0 11-21		0 NP-3 0 NP-3	8 - 1 - 8 - 1 5	6 - 33 - 4	1 17-28 0 5-12	6 33-41 6 36-49 	6 36-49 1 17-28 0 5-12	66 33-41 76 36-49 76 36-49 51 17-28
Liquid	llimit -	Pct	2 5		16-20 16-20 16-20	25	1 1	36-5 20-3	 56-6 61-7	61-7 36-5 20-3	56 61 76 61 76 61 76 61 76 61 76 61 76 61 76 61 76 61 76 61 76 76
ng	1 200				15-35 15-35 15-35	35-55	8 0 0 8 5 1 0	85-95 70-80	80-90 85-95 	85-95 85-95 70-80	8 8 8 8 8 8 8 8 8 9 9 9 9 9 9 9 9 9 9 9
ige passing number	40		08 - 1 - 1 - 1 - 1	¦ 	50-80	06-08	95-100 95-100	90-100 85-95	95-100 95-100	90-100 90-100 85-95 7	95-100 8 95-100 8 95-100 8 90-100 8
Percentage sieve nur			170-95		100 100 00	100	100	100	100	100 99-100 98-100	1000
Pe	4		7 5 - 9 5 - 7 5 - 9 5 - 1 - 9 5		100	100	100	100	100	100	1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
Fragments	3-10 inches	Pct	1519	¦ 	00	0	00	00	0 0	000	000 0
Fragi	>10 inches	Pct	1 5 0		00	0	00	o o	0 0	000	000 0
Classification	AASHTO		8 - 8 - 9 - 9 - 9 - 9 - 9 - 9 - 9 - 9 -		A-2-4 A-2-4	A-4, A-6	0 0	A-6, A-7-6 A-4, A-6		A-6, A-7-6 A-6, A-7-6 A-4, A-6	A-7-6 A-7-6 A-7-6 A-6, A-7-6
Classi	Unified		CL GC-GM, CL		WS	CI, SC	HO HO	m CH, CL m CL, CL-ML	CH	m CH, CL CH, CL m CL, CL-ML	
USDA texture			 Loam Cobbly loam Bedrock	Variable	ש ש	loamy line sand Sandy clay loam, fine sandy loam	silty	Clay, clay loam Silt loam, loam	Clay Clay, silty clay	Clay, clay loam Clay loam Silt loam, loam	Clay Clay Clay loam, silty clay Clay loam, loa
Depth	4	un	0-6 6-11 11-80	0-80	0-11 11-71	71-80	0-14 14-44	44-59 59-80	0 - 6 6 - 44	44-56 56-58 58-80	0 8 8 4 2 8 6 9 8 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9
Map symbol	and soil name		PvC: Picosa	Px: Pits	RhC: Rhymes		RoA: Rosenbrock		RoB: Rosenbrock		Rra: Rosenbrock

Table 22.--Engineering Index Properties--Continued

11-18	Map symbol	Depth	 USDA texture	Classification	ication	Fragments	lents	Pei	Percentage pass	passing ber	- =	Liquid	Plas-
In Per				Unified	 AASHTO	ω 	3-10 inches	4	10				ticity index
11-18 Centerment Centerme		uI				Pct	Pct		- 			Pct	
6-11 Extremely GC, GC-GN A-2-6, 0-10 60-90 35-75 25-55 20-50 25-35	SaD: Sancajo	9 - 0	 Very gravelly	0	A-2	0-10	0-30	5-7	5-55	5-55 2	20	5 - 3	7-15
11-18		6-11	loam Extremely	•	A-2	0-10	06-09	5-7	5-55	5-55 2	50	5-3	7-15
1111 State		7	cobbly loam						_	_		_	
18-28 Silt loam, loam CL, CL-ML		81 - 1 - 1 - 1	Cemented material				 			<u> </u>	 ¦		
ST-68 Fine sandy loam SC A-2-4, O O 95-100 95-100 70-95 20-45 25-45 20-45 25-45 20-45 25-45 20-45 25-45 20-45 25-45 20-45 25-45 20-45 25-45 20-45 25-45 20-45 20-45 25-45 20		18-38				0 0	00	100		-100		20-30	5-12
6-57 Sandy clay SC, SC-SM A-2-6, A-6 0 0 95-100 95-100 70-95 20-45 25-45 10 10 10 10 10 10 10 1	SeD: Sarnosa	9-0	sandy	 - SC		0	0	95-100		- 95		20-45	5-25
S7-66 Fibe sandy loam, Sc. SC-SM A-2-4, A-4 0 80-100 80-100 60-85 20-40 20-30		- - - - - - -			4	С		ப	95-1001	ا م	4 م ا	7-45	11-25
S7-68 Fine sandy clay SC, SC-SM A-2-4, A-4 0 0 80-100 80-100 60-85 20-40 20-30) 	loam, fine sandy loam,		1))	- — — -) 			- — — -))	ł
loam, loam, loam, loam, loam, loam, loam, loam, loam, loam, loam sandy clay loam flam loam, loam, loam, loam, loam, loam, loam, fine loam, loam CL loam, loam loam, loam, loam loam, loam, loam loam,		57-68	roam Fine sandy		, A-	0	0	80-100	80-100			20-30	4-10
attel			loam, loam, sandy clay										
attel 0-4 Clay loam CL		08-80	Sandy clay loam, fine sandy loam		A-	0	0	0	80-100	8 2		20-30	4-15
attel	shc:							(L (
ton	Schattel	4-24	oam clay		A-7	000	T 0 0	96-100	96-100 7 96-100 7				16-25 21-36
ton		24 - 27 - 25 - 80 80	Ø		A- / - 6 A- 7 - 6		0 0	000	00	1000	0.10		27-36
ton	StA:	C	-		, , , , , , , , , , , , , , , , , , ,		(, , , , , , , , , , , , , , , , , , ,					(
ton 0-22 Clay loam	THE CONTRACTOR OF THE CONTRACT	25-66	Sandy clay Sandy clay Sandy clay 	CL, SC CL CL-ML, S SC-SM,	A - 6 A - 4	000	000	1000			0 10 10		11-23 11-23 NP-14
	SxA: Sinton	0-22	 Clay loam Sandy clay			00	0 0	100	96-100 E				9-20 NP-14

Table 22.-Engineering Index Properties--Continued

g	_ = = -	Pct	60-95 56-76 33-49 65-95 56-76 33-49 65-95 56-76 33-49 65-95 56-76 33-49	40-75 35-48 15-25 40-75 35-48 15-25		28-65 20-30 8-15	28-75 30-42 15-26	28-80 25-40 11-24	28-65 20-30 8-15	28-75 30-42 15-26 28-75 30-42 15-26	28-80 25-40 11-24
Percentage passing sieve number	10 40		100 90-100 60-95 100 90-100 65-95 090-100 90-100 65-95 090-100 85-95 65-95	98-100 85-99		95-100 65-98	95-100 65-98	95-100 55-100	95-100 65-98	95-100 65-98 95-100 65-98	0 95-100 55-100 2
	3-10 4	Pct	0 100 0 100 0 90-100 0 90-100	000000000000000000000000000000000000000		0 95-100	0 95-100	0 95-100	0 95-100	0 95-100	0 95-100
Fragments	>10 3 inches in	Pct	0000	00		0	0	0	0	 0 0	 o
Classification	 AASHTO		 A-7-6 A-7-6 A-7-6	A-6, A-7-6 A-6, A-7-6	¦ 	 A-2-4, A-2-6,	A-2-6, A-6,	A-2-6, A-6	A-2-4, A-2-6,	A-2-6, A-6 A-2-6, A-6 A-2-6, A-6	A-2-6, A-6
	Unified		 CH CH CH	loam CI, SC CI, SC		 Loam CL, SC	CL, SC	CL, SC	loam CL, SC	loam CL, SC CL, SC	CL, SC
USDA texture			Clay Clay Clay Clay loam, cl	Sandy clay lc Sandy clay loam, clay loam	¦ 	 Fine sandy lo	Sandy clay loam, clay	Loam Sandy clay loam, fine sandy loam, loam	 Fine sandy lo	clay clay clay	loam Sandy clay loam, fine sandy loam,
Depth		u u	0 - 8 8 - 59 8 - 59 7 0 - 80	9 - 0	! ! !	0-7	7-73	73-80	0-11	11-15	36-80
Map symbol	and soil name		TcA: Tiocano	Usc: Ustarents	W: Water	WaB: Weesatche			WaC: Weesatche		

Table 22.--Engineering Index Properties--Continued

Map symbol	Depth	USDA texture	Classif	Classification	Fragments	Percer	Percentage passing sieve number	 Liquid	
and soil name	· 		Unified	AASHTO	>10 3-10 inches inches	4	10 40 200	_limit	limit ticity index
	uI				Pct Pct			Pct	
WeB: Weesatcher	σ Ι Ο	 - 	ر ت ت	9 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	 -		94-100 195-1-198	ر ا ا ا	11120
	9-29	Sandy	ICE, SC	A-2-6, A-6		95-100 95-			115-26
_	_		_	_	_	_	_	_	_
_	_	loam	_	_	_	_	_	_	_
_	29-71	Clay loam,	CL, SC	A-6, A-2-6	0 - 0 -	_	95-100 85-100 55-100 28-80 25-40 11-24	125-40	111-24
_	_	sandy clay	_	_	_	_	_	_	_
_	_	loam, fine	_	_	_	_	_	_	_
_	_	sandy loam	_	_	_	_	_	_	_
	71-80	71-80 Loam, sandy	CI	A-6	0 - 0 -	175-95 70-	170-95 60-80 51-65 25-40 11-24	125-40	111-24
_	_	clay loam	_	_	_	_	_	_	_

Table 23.--Physical Soil Properties

Lity

Map symbol	Depth	Clav	Mojst.	Permea-	Available	Linear	Organic	Erosio	on fact	ctors	Wind	Wind
and soil name	; ;	-	bulk density	bility (Ksat)		extensi- bility	matter	Kw	Mf		>	bility index
	uI	Pct]	In/hr	in/in	Pct	Pct			-' 		
Anc: Annarose	0 - 9 9 - 9 35 - 50 50 - 80	1 1 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.30-1.50 1.20-1.40 1.25-1.50 1.50-1.70	0.	0.10-0.17 0.10-0.17 0.10-0.17 0.10-0.17	0.00-2.9	0.5-2.0	8 2 2 8 8 2 8 8	8 2 2 2 2	ω 	m	9 8
Buchel	0-8 8-42 42-74 74-80	40-60	1.25-1.55 1.25-1.60 1.25-1.60 1.30-1.60	0.00.00	0.12-0.20 0.12-0.20 0.12-0.20 0.12-0.20	9.0-25.0-9.0-25.0-25.0-25.0-25.0-25.0-25.0-25.0-25	1.0-5.0			ω 	4.	
Buchel	0-14 14-76 76-80	40-60	1.25-1.55 1.25-1.60 1.30-1.60	0.00-0.06	0.12-0.20 0.12-0.20 0.12-0.20	9.0-25.01	2.0-5.0 1.0-3.0	222	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	ω 	4,	8
Campbellton	0 - 7 7 - 34 34 - 43 43 - 49	350-40	1.40-1.65 1.45-1.70 1.45-1.70 1.45-1.70 35-1.70	0.26	0.15-0.20 0.10-0.18 0.10-0.18 0.10-0.18		0.1.0	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~		ω — — — — — —	ω — — — — — —	
CaC: Campbellton	20 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	7			115-0.2					го 	ſΩ	
Choke	24-10 24-34 34-48 48-73	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2001.2001.2001.3001.3001.3001.3001.3001.	99999	.15-0. .15-0. .15-0. .15-0.	0.000	.0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	22222	υ 	4, IJ	φ ∞

Table 23.--Physical Soil Properties--Continued

- Wind	y bility index		9 8 	4 8	48	9 8	9 8 	9 8	% 	ω ∞
factors Wind	bility group		4 1	ω	0	4	4	4	4	4
tors			 	ω 	ω 	N	~ ~ ~ ~ ~	~ ~ ~ ~ ~	ω 	ω
1	M F			8 8 8 8 8	0 0 0 0 0 0 0 0 0 0	 3 3 5 8 8 7 7 7 7 8 8 8 7 7 8 8 8 8 7 7 8 8 8 8 7 8 8 8 8 7 8	ες. 2 4	. 32	8 8 8 8 8 8 8	
Erosion	Kw		322	3222	2222		. 32			
27 C	matter	Pct	1.0-4.0	1.0-3.0	1.0-3.0 1.0-3.0 0.5-2.0	1.0-3.0	1.0-3.0	1.0-3.0	0.0000000000000000000000000000000000000	5512.
	extensi- bility	Pct	3.00-5.9 1.00-5.9	3.00 0.00 0.00 0.00 0.00 0.00 0.00	0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.0	6.00 0.00 0.00 0.00 0.00 0.00 0.00	6.0-8	6.0-8.9	9.00-25.00-00-00-00-00-00-00-00-00-00-00-00-00-	0000
 	water capacity	In/in	0.15-0.20 0.15-0.20 0.10-0.18	0.12-0.20 0.15-0.20 0.15-0.20 0.12-0.16	0.12-0.20 0.15-0.20 0.15-0.20 0.12-0.16	0.10-0.20 0.02-0.20 0.02-0.08	0.14-0.20	0.14-0.20	0.10-0.17 0.10-0.17 0.10-0.17 0.10-0.17 0.10-0.17	1.15
Д В В В В	bility (Ksat)	In/hr	0.6-2	0.26-2 0.21-0.6 0.21-0.6	0.26-2 0.26-2 0.21-0.6	0.00 0.00 0.00 0.06 0.06 0.66 0.66	0.00-0.06	0.00-0.06	0.00-0.06	
	bulk density) 20/b	1.10-1.50 1.20-1.55 1.30-1.60	1.35-1.55-1.40-1.60-1.60-1.60-1.60-1.60-1.60-1.60-1.6	1.35-1.55 1.35-1.55 1.40-1.60	5 1.35-1.55 5 1.35-1.55 6 1.20-1.35 6 1.20-1.35	1.40-1.60	11.40-1.60	1.20-1.35 1.20-1.35 1.20-1.35 1.20-1.35	40-11
ر د د	3	Pct	25-40 25-40 20-35	25-35 35-45 27-40 27-40	25-35 35-45 27-40 27-40	40 - 35 - 55 - 55 - 55 - 55 - 55 - 55 - 5	40-55 18-35	40-55 18-35	35 - 60 - 60 - 60 - 60 - 60 - 60 - 60 - 6	27 - 45 1 2 2 2 2 2 2 2 2 2
	; ; ;	uI	0-11 11-54 54-80	0-12 12-21 21-59 59-80	0-11 11-45 45-70 70-80	0-13 13-16 16-28 28-80	0-13	0-18	0 - 7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1	0-11 11-50 50-62
— Lodmys ceM	and soil name		CeC: Choke	CkA: Clareville	CKB: Clareville	CnA: Condido	CoB: Conquista	CoG: Conquista	CtB: Cotulla	CyA: Coy

Table 23.--Physical Soil Properties--Continued

Wind erodi-	bility index		φ ∞		9 8	9 8	 5	\(\text{\text{\$\phi}} \\ \text{\$\phi} \\ \tex	9 8	9 8
factors Wind	bility group		4,		4 1	4, 1	ഗ	4,	4 1	4,
tors			ω 		ω 	ω 	~ ~ ~ ~ ~ ~ ~ ~		т м — — — — — —	m
1	Kf		8 8 8 8 8 8 8		8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8	00000		8 8 8 8 8		8 8 8 8 8
Erosion	Kw		8 8 8 8 8 8		8.8.8	000000		8 8 8 8 8 8 7 7	8 8 8 8	8 8 8 8
Organic	matter	Pct	11.00.00.00.00.00.00.00.00.00.00.00.00.0		1.0-3.0	1.00 0.50 0.51 0.51 0.51 0.31 0.31	1.0-3.0	1.0-3.0	1.0-3.0	1.00-4.0
Linear	extensi- bility	Pct	0.000	:	0.0 0.0 0.8 0.8 0.0 0.9		3.0-5 6.0-8 3.0-5 9.0-5	6.00-8 6.0-8 3.0-2.9	6.0-8 6.0-8 9.99 9.99	9.00
 Available	water capacity	lu/uI	0.15-0.20 0.14-0.18 0.14-0.18 0.14-0.18	 !	0.15-0.20 0.12-0.18 0.15-0.20	0.15-0.20 0.12-0.18 0.12-0.18 0.12-0.18	0.10-0.20 0.14-0.20	0.14-0.20 0.14-0.20 0.14-0.20 0.08-0.18	0.14-0.20 0.14-0.20 0.08-0.18	0.12-0.20 0.12-0.20 0.08-0.17
Permea-	bility (Ksat)	In/hr	0.2-0.6 0.00-0.06 0.00-0.06 0.00-0.06	;	0.06-0.2 0.00-0.06 0.06-0.2	0.06-0.2 0.00-0.06 0.00-0.06 0.00-0.06	0.2-0.6 0.06-0.2 0.2-2	0.0000000000000000000000000000000000000	0.00-0.06 0.00-0.06 0.6-2	0.00-0.06 0.00-0.06 0.00-0.00
Moist	bulk density	d/cc	1.35-1.55 1.40-1.60 1.40-1.60 1.40-1.60	 	.30-1.60 .35-1.60 .30-1.60	1.30-1.60 1.35-1.60 1.35-1.60 1.35-1.60 1.30-1.60	 1.40-1.55 1.35-1.55 1.35-1.55	1.150-1.50 1.20-1.50 1.20-1.35	1.15-1.50 1.20-1.50 1.20-1.35	1.05-1.35 1.10-1.45 1.05-1.45 1.00-1.35
Clay	1	Pct	277 35145 35155 35155 40155		30-40 35-55 30-40	30 - 40 35 - 40 35 - 55 30 - 40 140	15-30 35-45 5-15	40-50 40-55 27-40 15-27	40-50 40-55 15-27	40-60 55-65 60-75 55-80
Depth		uI	0-6 6-11 11-37 37-61 61-80		0-10 10-52 52-80	0-15 15-27 27-45 45-71	0-5	0-14 14-33 33-37 37-80	0-18 18-30 30-80	0-13 13-37 37-55 55-80
Map symbol	and soil name		Coy	DAM: Dam	DnA: Danjer	DnB: Danjer	Ecleto	EsA: Eloso	EsB:	EvA: Esseville

Table 23.--Physical Soil Properties--Continued

Wind erodi-			9 8	9 8	0	9 8	9 8	0	© ©
Wind erodi-	bility group		4,	4.	ω	4	m	∞	м
factors	EH .		m	- — — — — — - м			т — — — — — — — — — — — — — — — — — — —	4	~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~
	KF		3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	8 8 8 8 8	3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	.32	4 8 0 0 0	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	4. 4. 4. 4. E. E. E. E. E. E. E. E. E. E. E. E. E.
Erosion	Kw		2222	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	. 32	. 32	2	0 0 0 0 0	4 4 4 4 8 8 8 8 8
Organic	matter	Pct	1.0-4.0 1.0-4.0 0.5-2.0 0.1-0.5	1.0-4.0 1.0-4.0 0.5-2.0	2.0-4.0 1.0-4.0 1.0-2.0 0.1-0.5	1.0-2.0	1.0-3.0 0.5-1.0 0.1-0.5	00000000000000000000000000000000000000	1.0-3.0 0.5-2.0 0.5-1.0 0.5-1.0
Linear	extensi- bility	Pct	9.0-25.0 9.0-25.0 9.0-25.0 9.0-25.0	9.0-25.01 9.0-25.01 9.0-25.01	9.0-25.01 9.0-25.01 9.0-25.01	6.0-8.9	0.0-2.9 3.0-5.9 3.0-5.9	0 0 0 0 0	0.00-2.9 3.00-2.9 3.00-5.9
 Available		In/in	0.12-0.20 0.12-0.20	0.12-0.20 0.12-0.20 0.08-0.18	0.10-0.20 0.08-0.12 0.06-0.10	0.10-0.18 0.02-0.06	0.10-0.15 0.12-0.16 0.05-0.14	0.06-0.13 0.02-0.13 0.02-0.13 0.02-0.09	0.10-0.20
Permea-	bility (Ksat)	In/hr	90.00-00.0	90.00-00.0	90.00.00.00.00.00.00.00.00.00.00.00.00.0	0.06-0.2	0.2-0.6 0.2-0.6 0.2-0.6	0.612 0.210.6 0.612 0.612	0.6-2 0.00-0.06 0.06-0.2 0.06-0.2
Moist	bulk density	g/cc	1.05-1.35 1.10-1.45 1.05-1.45 1.00-1.35	1.05-1.35 1.10-1.45 1.05-1.45 1.00-1.35	1.10-1.25 1.15-1.35 1.15-1.35 1.15-1.35	1.30-1.45	1.40-1.65 1.40-1.65 1.40-1.65	1.40-1.65 1.25-1.45 1.25-1.45 1.40-1.70	1.40-1.70 1.50-1.75 1.40-1.65
Clay	1	Pct	40-60 55-65 60-75	40-60 55-65 60-75	40-55 45-60 45-60	30-50	10-20	18-35 35-55 35-55 18-40	10-18 20-40 20-34 15-34
Depth		un un	0-5 5-15 15-36 36-80	0-6 6-27 27-44 44-80	0-8 8-17 17-37 37-80	0-13	0-10 10-15 15-36	0-10 10-19 19-22 22-27 27-80	0-8 8-15 15-36 36-80
Map symbol	and soil name		EvB: Esseville	Evc: Esseville	Esseville	FaC: Fashing	Goliad	Hindes	ImA: Imogene

Table 23.--Physical Soil Properties--Continued

Map symbol	Depth	Clav	MO:	Permeal	 - Available	1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.1.	Organic	Erosion	n factor	<u>ω</u> –	Wind erodi-	Wind erodi-
and soil name	4		bulk density	bility (Ksat)	water capacity	extensi- bility	matter	Kw	Kf	E E	>	bility index
	In	Pct	g/cc	In/hr	in/in	Pct	Pct					
Lacoste	0-4 4-13 13-80	5-15 15-25	1.50-1.70	0.6-2 0.6-2 0.06-0.6	0.10-0.15 0.11-0.16	0.00	0.5-1.0 0.1-1.0 0.1-0.5			N	m	9 &
LpB: Laparita	0-6 6-42 42-56 56-81	35-47 35-47 1-45	1.40-1.70	0.6-2	0.12-0.20 0.10-0.20 0.03-0.16	0.00 0.00 0.00 0.00 0.00	1.0-3.0	322	3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	സ 	φ	48
LtA: Lattas	0-14 14-45 45-80	35-55	1.20-1.40 1.20-1.40 1.20-1.40	0.06-0.2 0.00-0.06 0.00-0.06	0.12-0.18 0.15-0.20 0.15-0.20	0 0 0 0 0 0 0 0 0	1.0-3.0 0.8-2.0 0.1-0.5		8 8 8 8 8 8 8 8 8 8 8 8	ω 	4 1	9 8
LtB: Lattas	0-22 22-55 55-80	35-55 35-55	1.20-1.40 1.20-1.40 1.20-1.40	0.06-0.2 0.00-0.06 0.00-0.06	0.12-0.18 0.15-0.20 0.15-0.20	0 0 0 0 0 0 0 0 0	1.0-3.0 0.8-1.2 0.1-0.5		2 2 2 2	ω 	4. T	9 8
Mata	0-5 5-31 31-44 44-80	18 – 35 20 – 40 20 – 40	1.35-1.60	000	0.07-0.12 0.07-0.12 0.07-0.12	0.00.00.00.00.00.00.00.00.00.00.00.00.0	1.0-4.0	.17		4.		0
MoA: Monteola	0-6 6-24 24-54 54-80	40 - 55 40 - 60 40 - 60	1.20-1.45 1.20-1.55 1.30-1.60 1.40-1.65	90.00.00	0.13-0.18 0.13-0.18 0.13-0.18	9.0-25.0 9.0-25.0 9.0-25.0 6.0-8.9	1.0-4.0 0.5-3.0 0.5-1.0	33.8.8.8.8.9.7.2.2.		ю 	4	9
MoB: Monteola	0-17 17-54 54-70 70-80	40-55	1.20-1.45 1.20-1.45 1.30-1.60 1.40-1.65	0.00-0.06	0.13-0.18 0.13-0.18 0.13-0.18 0.06-0.13	9.0-25.0 9.0-25.0 9.0-25.0 6.0-8.9	1.0 0.5-3.0 0.5-1.0 0.1-0		8. 8. 8. 8. 8. 7. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6. 6.	ιυ 	4	9 8

Table 23.--Physical Soil Properties--Continued

Wind - erodi- v bility			520	9 8	0	134	% &	% %	% &
Wind erodi- bility	group		Н	т	ω	Ø	т	т	м
			ιυ 	ω 	Н	ω 	ω — — — — — —	ω 	~
n factors	ΚĒ		 11222 77444	4 4 4	3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	1	8 8 8 8 8	2222	
Erosion	Κw		11 1 2 2 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1		0000	1 2.8.8.8.8.8.8.8.8.8.8.8.8.8.8.8.8	8 8 8 8 8	2222	
Organic matter	2	Pct	0.1-1.0	1.0-3.0	1.00-5.0	0.5-1.0 0.2-0.8 0.1-0.8	0.5-1.0 0.1-0.8 0.1-0.8 0.1-0.5	0.51.0 0.11.0 0.11.0 0.11.0	1.0-3.0
Linear extensi-	bility	Pct	0.00	0.00	0.00	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 3.00 3.00 1.00 1.00 1.00 1.00 1.00	0.00 3.00-2.00 3.00-5.00	0.00 3.00 3.00 0.00 0.00 0.00 0.00 0.00
 Available water	 >	in/in	0.05-0.08 0.05-0.11 0.12-0.17 0.08-0.12	0.10-0.16 0.10-0.16 0.10-0.16	0.05-0.10 0.05-0.10 0.01-0.05	0.07-0.11 0.13-0.20 0.13-0.18 0.12-0.17	0.11-0.16 0.13-0.18 0.12-0.17	0.11-0.16 0.13-0.18 0.12-0.17 0.12-0.17	0.10-0.15 0.12-0.17 0.12-0.18 0.00-0.00
Permea- bilitv	(Ksat)	In/hr	6-20 2-20 0.06-0.2 0.2-0.6	7	0.66-2 0.06-2 0.00- 0.6-2	2-6 0.06-0.2 0.06-0.2 0.06-0.2 0.06-0.2	0.06-0.2	0.002	0.6-2 0.2-0.6 0.2-0.6 0.06-0.6
Moist bulk	density	22/6	1.35-1.50 1.35-1.65 1.65-1.75 1.60-1.70	1.40-1.65 1.40-1.65 1.40-1.65	1.00-1.55 1.00-1.55 1.35-1.80 1.35-1.80	1.50-1.70 1.50-1.60 1.35-1.60 1.45-1.70	1.45-1.70 1.35-1.60 1.45-1.70	1.45-1.70 1.35-1.60 1.45-1.70 1.45-1.70	1.40 1.35-11.60 1.35-11.55 1.35-11.55 1.35-11.65
Clay		Pct	1 - 1 0 1 - 1 3 1 8 - 3 5 1 8 - 3 5 1 5 - 3 0	7-18 7-18 7-18	12-40 12-40 5-26	4-15 35-50 30-45 27-40 20-35	6-17 35-55 30-40 20-35	6-17 35-55 30-40	10-20 30-48 37-52
Depth		u I I I	0-29 29-37 37-54 70-80	0-24 24-39 39-80	0 - 8 8 - 18 18 - 30 - 8	0-12 12-17 17-36 36-60	0-8 8-25 25-66 66-80	0-11 11-27 27-59 59-80	0-5 5-11 11-19 19-28 28-80
Map symbol and soil name			Nusil	OdA: Odem	OmD: Olmos	Pab: Papalote	PbA: Papalote	PbB: Papalote	PoB: Parrita

Table 23.--Physical Soil Properties--Continued

Wind - erodi-			\(\text{\tin}\text{\te}\tint{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\texi}\text{\text{\text{\text{\text{\ti}}}\\ \tittt{\text{\text{\text{\text{\text{\text{\text{\text{\texi}\text{\text{\texi}\text{\text{\texi}}\tittt{\text{\text{\text{\text{\texi}\tiint{\text{\texi}\text{\text{\text{\text{\text{\text{\texi}\tint{\text{\texi}\texi	ν ∞	© &	ω ω	\(\text{\tin}\text{\te}\tint{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\text{\texi}\text{\text{\text{\text{\text{\ti}}}\\ \tittt{\text{\text{\text{\text{\text{\text{\text{\text{\texi}\text{\text{\texi}\text{\text{\texi}}\tittt{\text{\text{\text{\text{\texi}\tiint{\text{\texit{\text{\texi}\text{\texi}\titt{\text{\texi}\text{\text{\text{\tet	4 8	0
factors Wind erodi-	bility group		4	4	м	Ŋ	4 T	φ	∞
tors	H		N 		.v	n	m 		
- 1	K K F				0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			. 32	
Erosion	Kw				8 8 8 8 8 8		w 2112		.10
Organic	matter	Pct	0.0000000000000000000000000000000000000	1.0-3.0 1.0-3.0 0.1-0.5 0.0-0.5	1.0-3.0 1.0-2.0 0.5-2.0 0.3-1.0			1.0-3.0 0.5-2.0 0.1-0.3	
Linear	extensi- bility	Pct	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0.00 0.00 0.00 0.00 0.00 0.00			. 0	0.00	0.0-2.9
 	water capacity	In/in	0.14-0.20	0.14-0.20 0.12-0.18 0.00-0.00	0.11-0.16 0.13-0.18 0.13-0.19 0.13-0.19		.10-0.1	0.10-0.15	0.01-0.10
Permea-	bility (Ksat)	In/hr	0.066-0.2	0.06-0.2 0.06-0.2 0.06-0.2 0.06-2	0000 0000 0000	9 9 9 9 9		0.6-2 0.2-2 0.2-2	0.06-2
Moist —	bulk density	3/60	1.10-1.47	1.10-1.47	1.35-1.60 1.35-1.60 1.35-1.60 1.35-1.60	.35-11. .35-11.	. 35	1.30-1.45	
Clav	7	Pct	35-50	35-50 35-50 14-26 14-26	15-20 21-35 25-40 25-40	1 0 1 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1 3 1	m m 2 2	20 - 3 - 1 - 1 - 1 - 1 - 1	
Depth	- — — — -	In	0 - 6 6 - 12 12 - 16 16 - 24	0-4 4-11 11-14 14-80	0-7 7-20 20-36 36-52 52-59	59-80 0-7-114 14-26 36-36	59-80 0-11 11-54 54-80	0-6 6-11 11-80	08-0
Map symbol	and soil name		PkB: Pavelek	PkC2: Pavelek, severely eroded	Pmc: Pernitas	PnB: Pernitas	PtC: Pettus	PvC: Picosa	Px: Pits

Table 23.--Physical Soil Properties--Continued

bulk density (Ksat) capacity bility density (Ksat) capacity bility capacity capacity		Depth	Clay	Moist	Permea-	 Available	Linear	Organic	Erosion		factors Wind	Wind erodi-	Wind erodi-
1.10-1.35 0.00-0.06 0.14-0.20 0.0-2.9 0.5-1.0 0.17 1.17 5 1 2 2 2 2 2 2 2 2 2		_		bulk density	bility (Ksat)		extensi- bility	matter	Kw	Kf	E	bility group	bility index
1.35-1.50	In Pct	Pct			In/hr	ii	Pct	Pct					
1.10-1.35 0.00-0.06 0.14-0.20 6.0-8.9 2.0-5.0 0.24 2.4 4 4 8 1.10-1.35 0.00-0.06 0.14-0.20 6.0-8.9 1.0-5.0 0.24 0.24 0.24 1.10-1.35 0.00-0.06 0.13-0.19 3.0-5.9 0.1-0.5 0.28 0.2	0-11	$C \cap D$	1100-	.35-1. .35-1.	9 0 0	0.05-0.08 0.05-0.11		n	.17	.17	ω 		250
1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 2.0-5.0 .24 24 4 4 8 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .28 .28 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.000-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.000-0.01 0.0-2.9 0.1-0.5 .37 .37 1.35-1.60 0.6-2 0.05-0.10 0.0-2.9 0.1-0.5 .37 .37 1.35-1.50 0.6-2 0.02-0.05 0.0-2.9 0.1-0.5 .37 .37 1.40-1.65 0.6-2 0.000-0.12 0.0-2.9 0.1-0.5 .32 .32 1.40-1.65 0.6-2 0.06-0.12 0.0-2.9 0.1-0.5 .32 .32 1.40-1.65 0.6-2 0.06-0.12 0.0-2.9 0.1-0.5 .32 .32 1.50-1.35 0.6-2 0.000-0.12 0.0-2.9 0.1-0.5 .32 .32 1.50-1.35 0.6-2 0.000-0.12 0.0-2.9 0.1-0.5 .32 .32 1.50-1.45 0.2-0.6 0.08-0.15 6.0-8.9 0.1-0.5 .37 .37 1.50-1.45 0.2-0.6 0.08-0.15 6.0-8.9 0.1-0.5 .37 .37 1.65-1.80 0.2-0.6 0.03-0.08 0.0-8.9 0.1-0.5 .37 .37 1.65-1.80 0.2-0.6 0.03-0.08 0.0-8.9 0.1-0.5 .37 .37 1.65-1.80 0.2-0.6 0.03-0.08 0.08-0.15 6.0-8.9 0.1-0.5 .37 .37 1.65-1.80 0.2-0.6 0.03-0.08 0.08-0.15 0.08-	0-14 40-50 14-44 45-60 44-65 20-35 65-80 10-26	4 4 4 4 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0		1.10-1.35 1.10-1.35 1.10-1.35 1.10-1.35	0.00-0.06 0.00-0.06 0.2-0.6	0.14-0.20 0.14-0.20 0.13-0.19	6.00 6.00 8.00 0.00 0.00 0.00 0.00	2.0-5.0 1.0-3.0 0.1-0.5	2 2 2 2 8 8 4 4 8 E	2.2.8 4.4.8.0 	4,	4	9 8
1.10-1.35 0.00-0.06 10.14-0.20 6.0-8.9 2.0-5.0 .24 .24 4 4 8 1.10-1.35 0.00-0.06 10.14-0.20 6.0-8.9 1.0-3.0 .24 .24 4 4 8 1.10-1.35 0.00-0.06 10.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.00-0.06 10.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.00-0.06 0.14-0.20 6.0-8.9 1.0-3.0 .24 .24 1.10-1.35 0.00-0.06 0.13-0.19 3.0-5.9 0.1-0.5 .28 .28 1.35-1.60 0.6-2 0.05-0.10 0.0-2.9 0.1-0.5 .30 .30 1.35-1.60 0.6-2 0.05-0.10 0.0-2.9 0.1-0.5 .37 .37 1.20-1.35 0.6-2 0.00-0.01 0.01-0.05 0.0-2.9 0.1-0.5 .37 .37 1.20-1.35 0.6-2 0.10-0.15 0.0-2.9 0.1-0.5 .37 .37 1.20-1.35 0.6-2 0.10-0.15 0.0-2.9 0.1-0.5 .37 .37 1.40-1.65 0.6-2 0.00-0.12 0.0-2.9 0.1-0.5 .37 .37 1.40-1.65 0.6-2 0.00-0.12 0.0-2.9 0.1-0.8 .24 .24 1.40-1.65 0.6-2 0.00-0.12 0.0-2.9 0.1-0.8 .24 .24 1.40-1.65 0.6-2 0.00-0.12 0.0-2.9 0.1-0.8 .24 .24 1.40-1.65 0.6-2 0.00-0.12 0.0-2.9 0.1-0.8 .32 .32 1.50-1.45 0.2-0.6 0.08-0.15 6.0-8.9 0.1-0.5 .37 .37 .37 1.65-1.80 0.06-0.2 0.03-0.08 6.0-8.9 0.1-0.5 .37 .37 .37 1.65-1.80 0.06-0.2 0.03-0.08 6.0-8.9 0.1-0.5 .37 .37 .37 1.65-1.80 0.06-0.2 0.03-0.08 6.0-8.9 0.1-0.5 .37 .37 .37 1.65-1.80 0.06-0.2 0.03-0.08 6.0-8.9 0.1-0.5 .37 .37 .37 1.65-1.80 0.06-0.2 0.03-0.08 6.0-8.9 0.1-0.5 .37 .37 .37 1.65-1.80 0.06-0.2 0.03-0.08 6.0-8.9 0.1-0.5 .37 .37 .37 1.65-1.80 0.06-0.2 0.03-0.08 6.0-8.9 0.1-0.5 .37	0-6 40-50 6-44 45-60 44-56 40-50 56-63 30-40 63-80 10-26	40-5 30-4 10-2		.10-1.35 10-1.35 10-1.35 10-1.35 10-1.35	0.00-0.06 0.00-0.06 0.00-0.06 0.2-0.6		0.00.00	0			4.	4,	9
1.35-1.60 0.6-2 0.05-0.10 0.0-2.9 1.0-3.0 .10 .32 1 8 0 1.20-1.35 0.00-0.01 0.01-0.05 0.00-2.9 0.8-1.2 .10 .10 .10 .10 1.20-1.35 0.00-0.01 0.01-0.05 0.0-2.9 0.1-0.5 .37	0-8 40-50 8-52 45-60 52-72 45-60 72-80 20-35	0 (1) (1) 0		.10-1.35	0.0000000000000000000000000000000000000	0.14-0. 0.14-0. 0.14-0. 0.13-0.	0 0 0 0	1 0 0 1			4, — — — — —	4,	φ &
1.35-1.55 0.6-2 0.10-0.15 0.0-2.9 1.0-3.0 .24 .24 5 4 8 1.40-1.60 0.6-2 0.10-0.15 0.0-2.9 0.5-2.0 .24 .24 5 4 8 1.40-1.65 2-6 0.06-0.12 0.0-2.9 0.1-1.0 .24 .24 .140-1.65 2-6 0.06-0.12 0.0-2.9 0.1-0.8 .24 .24 .140-1.65 2-6 0.06-0.12 0.0-2.9 0.1-0.8 .24 .24 .140-1.65 2-6 0.06-0.12 0.0-2.9 0.1-0.8 .24 .24 .140-1.65 2-6 0.06-0.12 0.0-2.9 0.1-0.8 .32 .32 .33 .40 .40 .15-1.35 0.6-2 0.011-0.18 3.0-5.9 0.5-2.0 .32 .32 .33 .40 .10	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0			.35-1.60 .35-1.60 .20-1.35 .20-1.35	0	0.05-0.10 0.05-0.10 0.01-0.05 0.02-0.05	00000			.32		∞	0
1.15-1.35 0.6-2 0.11-0.18 3.0-5.9 0.5-2.0 .32 .32 3 6 4 4 4 4 4 4 4 4 4	0-6 8-29 6-57 8-29 57-68 8-29 68-80 8-29	7777		.35-1 .40-1 .40-1	0000	0.10-0.15 0.10-0.15 0.06-0.12	00	0.0.4.			ω 	4	φ ∞
	0-4 27-45 4-24 35-55 24-52 35-60 52-80 35-60	35 - 45 35 - 55 35 - 60		1.15-1.35 1.20-1.45 1.65-1.80 1.65-1.80	0.6-2 0.2-0.6 0.2-0.6 0.06-0.2	0.11-0.18 0.08-0.15 0.08-0.15 0.03-0.08	10 m m m	0.5-2.0 0.1-0.0 0.1-0.5	3 3 3 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	3 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	-	-	4, 8

Table 23.--Physical Soil Properties--Continued

bulk bilky water extensi- matter from	symbol	Depth	Clay	Moist	Permea-	 Available	Linear	Organic	Erosion	n factor	<u>ω</u> –	Wind erodi-	Wind erodi-
Pet		1		bulk density	bility (Ksat)	water apacity	xtensi bility	matter	Kw	Kf.		bility group	bility index
10 - 35 1.35 - 1.60 0.6 - 2 0.15 - 0.20 0.0 - 2.9 1.0 - 3.0 0.28 0.28 0.5 0.	ı – –	uI	Pct	0	In/hr	In/in	Pct	ĺυ					
18-35 1.35-1.60 0.6-2 0.15-0.20 0.0-2.9 1.0-3.0 .28 .28 5 6 4 19-35 1.40-1.65 2-6 0.07-0.15 0.0-2.9 0.5-2.0 .20 .20 .20 40-60 1.25-1.50 0.00-0.06 0.12-0.18 9.0-25.0 0.5-2.0 .32 .32 40-60 1.25-1.50 0.00-0.06 0.12-0.17 9.0-25.0 0.5-2.0 .32 .32 40-60 1.25-1.50 0.00-0.06 0.12-0.17 9.0-25.0 0.5-1.5 .32 .32 40-60 1.25-1.50 0.00-0.06 0.12-0.17 9.0-25.0 0.5-1.0 .32 .32 40-60 1.25-1.50 0.00-0.06 0.12-0.17 9.0-25.0 0.5-1.0 .32 .32 40-60 1.25-1.50 0.00-0.06 0.12-0.17 9.0-25.0 0.5-1.0 .32 .32 40-60 1.25-1.50 0.00-0.06 0.12-0.17 9.0-25.0 0.5-1.0 .32 .32 50-60 1.35-1.60 0.6-2 0.12-0.18 3.0-5.9 0.10-0.5 .24 .24 5 50-60 1.35-1.55 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 .32 .32 50-60 1.35-1.55 0.6-2 0.11-0.15 3.0-5.9 0.3-1.0 .32 .32 60-73 1.30-1.50 0.6-2 0.11-0.15 3.0-5.9 0.3-1.0 .32 .32 60-73 1.30-1.50 0.6-2 0.11-0.15 3.0-5.9 0.3-1.0 .32 .32 60-73 1.30-1.55 0.6-2 0.11-0.15 3.0-5.9 0.3-1.0 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.17 3.0-5.9 0.3-1.0 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.3-1.0 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.3-1.0 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.3-1.0 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32 .32 60-73 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32		0-25 25-66 66-80	0 - 3 0 - 3	1.35-1. 1.40-1.	9.9.	.15-0.2 .15-0.2	.0 -2	.0 - 3.	2.2.5	000	ω - – – – – -	rv	5
40-60 1.25-1.50 0.000-0.06 0.12-0.18 9.0-25.0 1.0-4.0 32 .32 5 4 4 4 4 4 4 4 5 1.5 1.5 0.000-0.06 0.12-0.17 9.0-25.0 0.5-1.5 32 .32	<u>-</u>	0-22	8 - 0 - 3 - 3	1.35-1.6	.6-	.15-0.2	.0-2.	.0-3.				 ω	4 8
25-40 1.35-1.60 0.6-2 0.12-0.18 3.0-5.9 0.5-2.0 .24 .24 5 6 4 25-40 1.35-1.60 0.6-2 0.12-0.18 3.0-5.9 0.1-0.5 .24 .24 5 6 4 25-40 1.35-1.60 0.6-2 0.12-0.18 3.0-5.9 0.1-0.5 .24 .24 5 6 4 26-40 1.35-1.50 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 .32 .32 5 3 8 20-35 1.30-1.55 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 .32 .32 .32 3 8 20-35 1.30-1.55 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 .32 .32 .32 .32 .32 .32 .32 .32 .32 .33	<u>-</u>	0-8 8-59 59-70 70-80		1.25-1.5 1.25-1.5 1.25-1.5 1.25-1.5	0.00-	.12-0.1 .12-0.1 .12-0.1	.0-25.		322 22 23 25 25 25 25 25 25 25 25 25 25 25 25 25	3222	ω 	4, 	9 &
14-20 1.35-1.55 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 .32 .32 5 3 8 20-35 1.30-1.55 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 .32 .32 5 3 8 20-35 1.30-1.55 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 .32 .32 .32 .32 .32 .32 .32 .33		9 - 0	5 – 4 5 – 4		-9.	.12-0.1	.0-5.	.5-2.			υ 	о О	4 8
14-20 1.35-1.55 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 .32 .					i	İ	i	İ			I		
14-20 1.35-1.55 0.6-2 0.11-0.15 0.0-2.9 1.0-4.0 32 5 3 8 20-35 1.30-1.50 0.6-2 0.11-0.15 3.0-5.9 1.0-3.0 32 .32 5 3 8 20-35 1.30-1.50 0.6-2 0.15-0.20 3.0-5.9 0.5-2.0 .32 .32 32		0-7 7-73 73-80	4 – 2 0 – 3 6 – 3	1.35-1.5 11.30-1.5	9 9 9	.11-0.1 .15-0.2 .10-0.1	.0-2.	. 0 - 4	322	m m m	ω 	m	φ &
16-27 1.30-1.50 0.6-2 0.12-0.17 3.0-5.9 1.0-4.0 .32 .32 5 5 5 5 20-35 1.30-1.50 0.6-2 0.15-0.20 3.0-5.9 0.5-2.0 .32 .32 18-35 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.3-1.0 .32 .32 15-30 1.30-1.55 0.6-2 0.10-0.15 3.0-5.9 0.2-0.8 .32 .32		0-11 11-15 15-36 36-80	4 – 2 0 – 3 6 – 3	1.35-1.5 1.30-1.5 1.30-1.5	9 9 9 9	.11-0.1 .11-0.1 .15-0.2	.00-2	.0-4.	2222	m m m m	ω 	m	φ &
		0-9 9-29 29-71 71-80	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.30-1.5 1.30-1.5 1.30-1.5	9 9 9	.12-0.1 .15-0.2 .10-0.1	.00.00		8,8,8,8		 	ω — — — — — —	N O

Table 24.--Chemical Soil Properties

(Absence of an entry indicates that data were not estimated.)

Map symbol and soil name	Depth	 Cation exchange capacity 	reaction		Gypsum	Salinity	Sodium adsorp- tion ratio
	Inches	 meq/100 g	 pH	 Pct	Pct	mmhos/cm	
Annarose	0-9 9-25 25-50 50-80	 10-20 10-20 10-20 10-20	7.4-8.4 7.9-8.4 7.9-8.4 7.9-8.4	20-35 20-35	0	0 0 0	 0 0 0
BcA: Buchel	0-8 8-42 42-74 74-80	 30-50 30-50 30-50 30-50	 7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4	20-30	0 0 0 0	0.0-4.0 0.0-4.0 0.0-4.0 0.0-8.0	 0-2 0-10 0-10 5-15
BfA: Buchel	0-14 14-80	 30-50 30-50	7.4-8.4 7.4-8.4		0	0.0-4.0 0.0-4.0	 0-2 0-10
CaB: Campbellton	0-7 7-34 34-43 43-80	 15-25 15-25 20-35 15-25	7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4	10-25	0 0 0-5 2-10	0.0-2.0 0.0-2.0 4.0-8.0 4.0-16.0	 0 0 0 0
CaC: Campbellton	0-9 9-22 22-58 58-80	15-25 20-35 20-35 15-25	7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4		0 0-5 0-5 0-10	0.0-2.0 4.0-8.0 4.0-8.0 4.0-16.0	0 0 0 0
CeB: Choke	0-10 10-24 24-34 34-48 48-73 73-80	25-40 25-40 25-40 25-40 20-40 20-35 20-35	7.9-8.4 7.9-8.4 7.9-8.4 7.9-8.4 7.9-8.4 7.9-8.4	10-15 15-30 15-30 15-30	0 0 0	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 2.0-8.0 4.0-16.0	0 0 0 0 0 0 0 0 2 0 2 0 2 2 8 0 2 2 8 0
CeC: Choke	0-11 11-61 61-80	25-40 25-40 25-40 20-35	7.9-8.4 7.9-8.4 7.4-8.4	10-15		0.0-2.0 0.0-2.0 4.0-16.0	 0 0 2-8
CkA: Clareville	0-12 12-21 21-59 59-80	 20-35 20-45 30-50 30-50	 6.6-7.8 6.6-7.8 7.9-8.4 7.9-8.4	0 5-30	0 0 0 0	0 0 0 0.0-4.0	
CkB: Clareville	0-11 11-45 45-70 70-80	20-35 20-45 30-50 30-50	 6.6-7.8 6.6-7.8 7.9-8.4 7.9-8.4	5-30	0 0 0	0 0 0 0.0-4.0	0 0 0 0-2
CnA: Condido	0-13 13-16 16-28 28-80	30-45 30-45 30-45 30-40	6.6-7.8 6.6-7.8 7.4-8.4 7.4-8.4	0 5-15 40-50 5-30		0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	0 0 0-2 0-2

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name	Depth	Cation exchange capacity 			 Gypsum 	Salinity	Sodium adsorp- tion ratio
	Inches	meq/100 g	 pH 	 Pct	Pct	mmhos/cm	-
CoB: Conquista	0-13 13-80	 35-45 15-30	7.4-8.4 7.4-8.4	0-10	0 I 0 I	0.0-2.0 2.0-8.0	0 2-8
CoG: Conquista	0-18 18-80	35-45 15-30	7.4-8.4 7.4-8.4	0-10	0 0 0	0.0-2.0 2.0-8.0	0 2-8
CtB: Cotulla	0-7 7-12 12-18 18-34 34-52 52-80	30-50 30-50 30-50 30-50 30-50 30-50	7.4-8.4 7.4-8.4 7.9-8.9 7.9-8.9 7.9-8.9 7.9-8.9	2-20	0-2 0-2 0-2 0-2 0-5 2-10 2-10	0.0-2.0 0.0-2.0 0.0-2.0 2.0-4.0 4.0-8.0 4.0-16.0	0-10 0-10 2-12 13-40 13-40
СуА: Соу	0-11 11-50 50-62 62-80	 25-45 25-45 25-45 20-35	 7.9-8.4 7.9-8.4 7.9-8.4 7.9-8.4		0 0-5 0-5 0-10	0.0-2.0 0.0-2.0 0.0-2.0 2.0-8.0	 0-2 2-5 2-5 4-15
СуВ: Соу	0-6 6-11 11-37 37-61 61-80	25-45 25-45 25-45 25-45 25-45 20-35	 7.9-8.4 7.9-8.4 7.9-8.4 7.9-8.4 7.9-8.4	2-10 5-20	0 0 0-5 0-10 0-10	0.0-2.0 0.0-2.0 0.0-2.0 2.0-4.0 2.0-8.0	0-4 0-4 2-5 4-15
DAM:	 		 				
DnA: Danjer	0-10 10-52 52-80	 27-36 32-50 27-36	 7.4-8.4 7.4-9.0 7.9-8.4		0 0 0 0	0.0-4.0 0.0-4.0 0.0-4.0	 0 0 0
DnB: Danjer	0-15 15-27 27-45 45-71 71-80	27-36 20-27 20-27 20-27 25-35 20-27	7.4-8.4 7.4-8.9 7.4-8.4 7.4-8.4 7.4-8.4		0	0.0-4.0 0.0-4.0 0.0-4.0 0.0-4.0 0.0-4.0	 0 0 0 0
EcB: Ecleto	0-5 5-18 18-80	 10-15 30-35 	 6.1-7.3 6.1-7.8 6.6-7.8	0-5	0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0	 0-2 0-4 2-8
EsA: Eloso	0-14 14-33 33-37 37-80	 30-40 30-40 30-40 30-40	 6.6-7.8 7.4-8.4 7.4-8.4	0-15 5-30		0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	 0 0 0
EsB: Eloso	0-18 18-30 30-80	 30-40 30-40 30-40	 6.6-7.8 7.4-8.4 7.4-8.4	0-15	0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0	 0 0 0

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name	Depth 	Cation exchange capacity	reaction		Gypsum 	Salinity	Sodium adsorp- tion ratio
	Inches	<u>meq/100 g</u>	 pH 	 Pct	Pct	mmhos/cm	_
EvA: Esseville	 - 0-13 13-37 37-55 55-80	30-60	6.6-8.4 6.6-8.4 6.6-8.4 6.6-8.4			0.0-4.0 2.0-8.0 4.0-16.0 4.0-16.0	0-5 2-12 13-30 13-30
EvB: Esseville	0-5 5-18 18-36 36-80	30-60	 6.6-8.4 6.6-8.4 6.6-8.4 6.6-8.4	2-15 2-15 2-15 2-15	0 0-10 5-20 5-20	0.0-4.0 2.0-8.0 4.0-16.0 4.0-16.0	0-5 2-12 13-30 13-30
EvC: Esseville	 - 0-6 6-27 27-44 44-80	 30-50 30-60 30-50 30-50	 6.6-8.4 6.6-8.4 6.6-8.4 6.6-8.4	2-15 2-15 2-15 2-15 2-15	0 0-10 5-20 5-20	0.0-4.0 2.0-16.0 4.0-16.0 4.0-16.0	 0-5 2-12 13-30 13-30
ExC: Esseville	 - 0-8 8-17 17-37 37-80	25-40 25-40 40-60 35-60	 6.6-8.4 6.6-8.4 6.6-8.4 6.6-8.4	1-5 1-5 3-15 1-5	0-1 1-2 2-10 5-20	0.0-2.0 2.0-8.0 8.0-16.0 8.0-16.0	 1-5 5-10 10-25 15-30
FaC: Fashing	0-13	30-40	7.4-8.4	0-5	0	0.0-4.0 0.0-4.0	0-2
GoB: Goliad	0-10 10-15 15-36 36-80	1.0-5.0 4.0-20 15-25 	6.6-8.4 6.6-8.4 7.4-8.4 7.4-8.4	0-1	0 0 0 	0 0 0 	 0 0 0
HnD: Hindes	0-10 10-19 19-22 22-27 27-80		6.1-7.8 6.1-7.8 7.4-8.4 7.4-8.4 7.4-8.4	0	0 0 0 0 0	0 0 0 0 0.0-2.0	0 0 0 0 0-1
ImA: Imogene	0-8 8-15 15-36 36-80	6.0-20	6.1-7.8 6.6-8.4 7.4-9.0 7.4-9.0	0-5	0 0-5 0-7 2-15	0.0-4.0 0.0-4.0 4.0-16.0 4.0-16.0	0-10 6-13 13-30 13-40
LaB: Lacoste	 - 0-4 4-13 13-80	1.0-7.0	 6.1-8.4 6.1-8.4 7.4-8.4	0-2	0 0 	0.0-2.0 0.0-2.0 	 0-2 0-2
LpB: Laparita	 - 0-6 6-42 42-61 61-80		6.1-7.3 6.1-7.8 7.9-8.4 7.4-8.4	0-10 0-12		0.0-2.0 4.0-16.0 8.0-16.0 4.0-8.0	0-12 2-12 2-20 2-20
LtA: Lattas	 - 0-14 14-45 45-80	 15-35 25-40 25-40	7.4-8.4 7.4-8.4 7.4-8.4	2-10	0 0 0 0 0	0.0-4.0 0.0-4.0 4.0-8.0	0-4 4-12 4-12

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name	-	 Cation exchange capacity 	 Soil reaction 	 Calcium carbon- ate		Salinity	Sodium adsorp- tion ratio
	Inches	 meq/100 g	 pH	 Pct	Pct	mmhos/cm	. l
LtB: Lattas	0-22 22-55 55-80	20-35 25-40 25-40	7.4-8.4 7.4-8.4 7.4-8.4		0 0 0-5	0.0-4.0 0.0-4.0 4.0-8.0	0-4 0-4 4-12
MaD:		 	l 				
Mata 	0-5 5-31 31-44 44-80	10-25 10-30 5.0-25 	7.4-8.4 7.4-8.4 7.4-8.4 		0 0 0-5 	0.0-2.0 0.0-8.0 4.0-16.0	0-12 0-12 0-4
MoA:	0-6	 16-36	, 7.4-8.4	0-10	0	0.0-4.0	0-2
	6-24 24-54 54-80	16-39 16-39 25-40	7.4-8.4 7.4-8.4 7.4-8.4	0-10 0-15 0-15	0-3 2-5 2-5	2.0-4.0 2.0-4.0 4.0-8.0	0-2 0-12 2-12
MoB: Monteola 	0-17 17-54 54-70 70-80	 16-36 16-39 16-39 25-40	7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4		0 0-3 2-5 2-5	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 4.0-8.0	0-2 0-2 0-4 2-12
NuC: Nusil	0-29 29-37 37-54 54-70 70-80	1.0-5.0 1.0-5.0 10-25 10-25 10-30	6.1-7.8 6.1-7.8 6.1-7.8 6.1-8.4 6.1-8.4	0 0 0 0 0 0 0 0 0 0	0 0 0 0	0 0 0.0-2.0 0.0-2.0 0.0-2.0	0 0 0-8 0-4 0-4
OdA: Odem	0-24 24-39 39-80	 5.0-25 10-25 10-25	 6.1-8.4 6.6-8.4 7.4-8.4		0 0 0	0.0-2.0 0.0-2.0 0.0-2.0	
OmD: Olmos	0-8 8-18 18-30 30-80	5.0-20 5.0-20 5.0-20 3.0-15 3.0-15	7.4-8.4 7.4-8.4 7.9-8.4 7.9-8.4	40-70 40-70 50-80 45-90	0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-4.0	 0 0 0 0-15
PaB: Papalote	0-12 12-17 17-36 36-60 60-80	 5.0-15 10-25 10-25 15-30 15-30	5.6-7.8 6.1-7.8 6.1-8.4 6.6-8.4 6.6-8.4	0 0 0 0 0 0 0 0 0 0	0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	
PbA: Papalote	0-8 8-25 25-66 66-80	 5.0-15 10-25 15-30 15-30	 5.6-7.8 6.1-8.4 6.6-8.4 6.6-8.4	0	0 0 0 0	0.0-1.0 0.0-1.0 0.0-2.0 0.0-2.0	
PbB: Papalote	0-11 11-27 27-59 59-80	5.0-15 10-25 15-30 15-30	5.1-7.8 6.1-8.4 6.6-8.4 6.6-8.4	0-5	0 0 0	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	 0 0 0

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name		Cation exchange capacity 	reaction		Gypsum 	Salinity	Sodium adsorp- tion ratio
	Inches	 meq/100 g	 pH	Pct	Pct	mmhos/cm	_
PcB: Parrita	0-5 5-11 11-19 19-28 28-80		 6.6-8.4 6.6-8.4 7.4-8.4 7.9-8.4 7.9-8.4	5-15 40-80	0 0 0 0 0 0-2	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	
PkB: Pavelek	0-6 6-12 12-16 16-24 24-80	35-40 35-40 35-40 35-40 	7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4 7.9-8.4 7.9-8.4	40-50	0 0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	 0 0 0 0
PkC2: Pavelek, severely eroded	0-4 4-11 11-14 14-80	 35-40 35-40 30-40	 7.4-8.4 7.4-8.4 7.9-8.4 7.9-8.4	40-50	0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0	 0 0 0 0
PmC: Pernitas	0-7 7-20 20-26 26-35 35-58 58-80	1 10-20 1 15-30 1 20-30 1 20-30 1 10-20 1 10-20	7.4-8.4 7.4-8.4 7.4-8.4 7.9-8.4 7.9-8.4 7.9-8.4	10-40	0 0 0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	
PnB: Pernitas	0-7 7-14 14-26 26-36 36-59 59-80	10-25 15-30 20-30 20-30 20-30 20-30	 7.4-8.4 7.4-8.4 7.4-8.4 7.9-8.4 7.9-8.4	10-40	0 I 0 I 0 I 0 I 0 I	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	
PtC: Pettus	0-11 11-54 54-80	 15-25 10-18 8.0-18	7.9-8.4 7.9-8.4 7.9-8.4		0 0 0	0.0-2.0 0.0-2.0 0.0-2.0	 0 0 0
PvC: Picosa	0-6 6-11 11-80	 10-20 	7.4-8.4 7.4-8.4 7.4-8.4		0 	0.0-2.0	 0
Px: Pits	0-80		7.4-8.4	0 1	0	0.0-2.0	0
RhC: Rhymes	 0-11 11-71 71-80	 1.0-5.0 1.0-5.0 8.0-25	 5.6-7.8 5.6-7.8 5.6-8.4		0 I 0 I 0 I	0.0-2.0 0.0-2.0 0.0-2.0	 0 0 0-4
RoA: Rosenbrock	0-14 14-44 44-59 59-80	40-45 30-45 25-35 10-25	7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4	0-2 5-20 25-35 5-30		0.0-2.0 0.0-4.0 2.0-8.0 2.0-8.0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name	-	 Cation exchange capacity 	 Soil reaction 	 Calcium carbon- ate	 Gypsum 	Salinity	Sodium adsorp- tion ratio
	Inches	 meq/100 g	 pH	 Pct	Pct	mmhos/cm	-
RoB: Rosenbrock	0-6 6-44 44-56 56-58 58-80	40-45 30-45 30-45 25-35 10-25	7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4	5-20 5-20 5-35	0 0 0 0 0	0.0-2.0 0.0-4.0 0.0-4.0 2.0-8.0 2.0-8.0	0 0-2 0-2 2-8 4-16
RrA: Rosenbrock	0-8 8-42 42-59 59-80	40-45 30-45 30-45 25-35	7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4	5-15 5-20	0 0 0 0	0.0-2.0 0.0-2.0 0.0-4.0 2.0-8.0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
SaD: Sancajo	0-6 6-11 11-18 18-38 38-80	5.0-20 30-40 30-40 30-40	7.4-8.4 7.9-8.4 7.9-8.4 7.9-8.4 7.9-8.4	40-60 40-60 20-50	0 0 0 0 0	0.0-2.0 0 0 0.0-2.0 0.0-2.0	
SeD: Sarnosa	0-6 6-57 57-68 68-80	 10-25 10-25 10-25 10-25	7.9-8.4 7.9-8.4 7.9-8.4 7.9-8.4	10-40	0 0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	
ShC: Schattel	0-4 4-24 24-52 52-80	 25-40 32-50 32-50 32-55	7.4-8.4 7.4-8.4 7.4-8.4 7.4-8.4		0 0-15 0-15 0-30	0.0-4.0 2.0-8.0 8.0-16.0 8.0-16.0	 0-10 0-10 0-13 4-30
StA: Sinton	0-25 25-66 66-80	 15-30 15-30 15-30	7.4-8.4 7.4-8.4 7.4-8.4	0-30	0 0 0	0 0 0	 0 0 0
SxA: Sinton	0-22 22-80	 15-30 15-30	7.4-8.4 7.4-8.4	0-30 0-35	0 I 0 I	0	 0 0
TcA: Tiocano	0-8 8-59 59-70 70-80	 25-45 25-45 25-45 15-35	 6.6-7.8 7.4-8.4 7.4-8.4 7.4-8.4	0-15	0 0 0 0 0	0.0-2.0 0.0-2.0 0.0-2.0 0.0-2.0	
UsC: Ustarents	0-6 6-80	 15-35 15-35	 6.6-8.4 6.6-8.4		0-2 0-2	0.0-2.0 0.0-2.0	 0-2 0-2
W: Water		 	 				
WaB: Weesatche	0-7 7-73 73-80	 10-25 15-25 15-30	 6.6-7.8 7.4-8.4 7.9-8.4	0-10	0 0 0 0-2	0.0-2.0 0.0-2.0 0.0-2.0	 0 0 0-2

Table 24.--Chemical Soil Properties--Continued

Map symbol and soil name	Depth	 Cation exchange capacity 	 Soil reaction 	 Calcium carbon- ate	Gypsum	Salinity	Sodium adsorp- tion ratio
	Inches	meq/100 g	рн	Pct	Pct	mmhos/cm	_
WaC:		 	 				
Weesatche	0-11	10-25	6.6-7.8	0-2	0	0.0-2.0	1 0
1	11-15	15-25	7.4-8.4	0-2	0	0.0-2.0	1 0
1	15-36	15-25	7.4-8.4	0-10	0	0.0-2.0	1 0
	36-80	15-30	7.9-8.4	25-55	0-2	0.0-2.0	0-2
WeB:		 	 				
Weesatche	0-9	15-25	6.6-7.8	0-2	0	0.0-2.0	i O
	9-29	15-25	7.4-8.4	0-10	0	0.0-2.0	i o
	29-71	10-20	7.9-8.4	25-55	0-2	0.0-2.0	0-2
İ	71-80	5.0-20	7.9-8.4	25-50	0-2	0.0-2.0	0-2
1		 	 	 			

Table 25.--Water Features

(Depths of layers are in feet. See text for definitions of terms used in this table. Estimates of the frequency of ponding and flooding apply to the whole year rather than to individual months. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

				Water	table		Ponding		Floc	Flooding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				FF C	Ft	Ft				
Anc: Annarose	 	Low								
	_		January	-				None	-	None
	_		February				!	None	-	None
	_		March				!	None	-	None
	_		April				!	None		None
	_		May				!	None	-	None
	_		June				!	None	-	None
	_		July	_ -				None		None
	_		August	-				None	-	None
	_		September		-		 - 	None	-	None
	_		October	-				None		None
	_		November	-	-		 	None		None
	_		December		-		 	None	-	None
BcA: Buchel		Ніай								
	_		May				!	None	Very brief	Occasional
	_		June	-				None	Very brief	Occasional
	_		July				!!!	None	Very brief	Occasional
	_		August					None		Occasional
	_		September		-		 	None	Very brief	Occasional
BfA:										
Buchel	О —	High		_	_					
	_		May				!	None	Brief	Frequent
	_		June	-	1 1			None	Brief	Frequent
	_		July				!	None	Brief	Frequent
	_		August	- 			1	None	Brief	Frequent
	_		September	-			!	None	Brief	Frequent
	_		_	_	_	_		_	_	_

Table 25. -- Water Features -- Continued

				Water	table		Ponding		Floo	Flooding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
Cambellton		Medium		Ft	F.T.	H T				
, , , , , , , , , , , , , , , , , , ,	- — - ' - — -		January				 - 	None	-	None
			February				 	None		None
			April		!			None		None
	_		May	1	-		!!!	None	-	None
	_		June	-		-		None		None
			July	-	-		 	None	!	None
			August Somtombox				 	None	 	None
						 		NOIN		None
			November	!			!!!	None		None
			December	!				None		None
CaC: Campbellton		Medium								
) 	3	January		:		!	None		None
	_		February				1	None		None
	_		March	!			 	None	!	None
			April	-				None		None
			May	!	-		 	None	 	None
			June Tulw		¦ ¦	 	 	N O D O	 	None None
			Andust				 	None		None
			September					None		None
	_		October	!	!	-		None		None
			November	!			1	None		None
			December		<u> </u>	 - -	!	None		None -
CeB: Choke		Low								
			January	!	-	-		None		None
	_		February	-	-			None		None
	_		March				 	None	!	None
	_		April		!		 	None	!	None
	_		May	!!!			 	None		None
	_		June				 	None	!	None
			July	-	<u> </u>	_ ·	!	None	!	None
			August	! !	 	 ! !	 	None	! !	None
			September		! ! ! ! ! !	 	 	None	 	None
			November	!			1	None	!	None
	· —		December	!			!!!	None	!	None
	_		_			_		_		_

Table 25.--Water Features--Continued

				Water	Water table		Ponding		Flooding	ding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
CeC:	μ	, L		T T	H T	Ħ				
	 -	\$) 1	January	-	-			None		None
	_		February	-	-		1	None	-	None
	_		March	-				None	-	None
	_ :		April	-	-			None	:	None
			May			_ :	 	None	-	None
	_		June	 - -	 - -	 	 	None	-	None
			July	!		:	 	None	-	None
			August		:	 	 	None	!	None
	_		September					None		None
	_		October		! !	_ ! !	! !	None	!	None
			November					None	-	None
					 -	 ! ! 	 	D I		NOITO NO
CkA: Clareville		Ν̈́C								
)) - –	:	Januarv	-	-	:	1	None	-	None
			February		-	!		None	-	None
			March		1 1		!!!	None	!	None
			April		-	:	1	None	-	None
	_		Мау					None	-	None
	_		June	-	-	-		None	-	None
	_		July	-	-			None		None
	_		August		-		1 1	None		None
	_		September		-	-	 	None	-	None
	_		October					None	!	None
			November			!	 	None	-	None
			December	<u> </u>	<u> </u>	<u> </u>	 	None	! ! !	None
CkB: Clareville		Medium								
	, _		Januarv		-		1	None		None
			February		:	-	!	None	-	None
	_		March	-	-		1 1	None	-	None
	_		April	-			1 1	None		None
	_		May		-		1	None		None
	_		June		-		1	None	-	None
	_		July					None	-	None
	_		August	-	-	_ - -	1 1	None	-	None
	_		September		-			None	-	None
			October		! !	_ - 	!!!	None	!	None
	_		November		-		!!!	None	!	None
	_		December					None	-	None
	_		_		_	_		_		_

Table 25.--Water Features--Continued

				Water	table		Ponding		F100	Flooding
Map symbol and soil name	Hydro- logic group	Surface	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				F t	Ft	꿆				
CnA: Condido	<u></u> 	Very high								
			January			 		None		None
			February					NOII O	 	NOIIG
			Marcn April				 	None		None
			M V				!	None	!	None
			June			!		None		None
	_		July			-	-	None		None
			August				!	None	!	None
	_		September	-	-		-	None	-	None
	_		October		!		!	None	!	None
	_		November		-			None		None
			December	 	!		!	None	 	None
CoB:	-	Very high								
Condataca	 J	116T11 & TD 1	Traction			 	!	N	!	N CN
			February			!		None	!	None
			March					None	;	O U
			April	-		-	!	None	-	None
			Mav				!	None		None
	_		June		-	-	!	None	-	None
	_		July			!		None	-	None
	_		August				!	None	-	None
	_		September			!	!	None	!	None
	_		October	1	!	_ ! !	!	None	!	None
	_		November		-	-	!	None		None
			December					None	!	None
CoG:	_ -	Very high								
3		::	Januarv			-	!	None	!	None
	- —		February	-				None		None
	_		March	-	-	_ - -	!	None		None
	_		April	1			!	None	!	None
	_		May	-	-	_ 	!	None		None
	_		June	1		_ 	!	None	!	None
	_		July					None	!	None
	_		August	-	-		!!!	None	!	None
	_		September		 - -			None		None
	_		October				!	None	!	None
	_		November	 	 - -		 	None	!	None
	_		December			_ 	!	None	!	None
	_		_			_		_		_

Table 25.--Water Features--Continued

				Water	table		Ponding		F100	Flooding
Map symbol and soil name	Hydro- logic group	Surface	Month	Upper	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				Fit T	Et.	Ff				
CtB: Cotulla		 Very high								
			January			 		None		None
			February	 	 - -		 	NOING	!	D ON I
			Marcn April			 ! !	 	None		None
			May v	!			!	None	;	None
			June		-	-	!!!	None		None
			July			-		None	!	None
			August	-				None		None
	_		September				!	None	!	None
	_		October	-	-		!!!	None	!	None
	_		November		-		 - -	None	 	None
			December	 ! !	 - -	 !	 	None	 	None
CyA:		, , , ,								
	 	11674		 !		 ! !	!	N C C C C C	!	N S
			February			 		N OII C		NOTION
			Moxch Moxch	!			!	Nonc	!	Nonce
			Anril					None		None
			May V		 - -			None		None
			June		-	-	!	None	-	None
			July	-	-	:	!	None		None
			August					None	-	None
			September		-	-	!	None		None
	_	_	October				1	None	-	None
	_		November	-	-		!	None	!	None
			December	!	!		!	None		None
CyB:										:
Coy	— - — -	Very high	H							
			January February			 !	 	None		None
			February March	-	-		!	None		None
			April				1	None	-	None
	_		May	-		-	!	None	!	None
	_		June					None		None
	_	_	July					None		None
	_	_	August				!	None		None
	_		September	-				None	!	None
			October	-			!	None	!!!	None
			November	-				None	!	None
			December					None		None
	_		_		_	_		_		_

Table 25.--Water Features--Continued

				Water	table		Ponding		F100	Flooding
Map symbol and soil name	Hydro- logic group	Surfacerunoff	Month	Upper	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
DAM: Dam	 	-								
			Jan-Dec		!		!!!	None	-	:
DnA: Danjer		High				- — —				
	_		January	-	-		!	None		None
	_		February					None		None
	_		March	-				None	!	None
	_		April	_ -			!	None	!	None
	_		May	-				None	!	None
	_		June	-			!!!	None	!	None
	_		July	_ -	 - -			None	!!!	None
	_		August					None		None
	_		September					None	-	None
	_		October	-		-	1	None	1	None
	_		November		-		!!!	None	!	None
	_		December		!	<u> </u>	 	None	 	None
DnB:										
Danjer	— О —	Very high	_			_		_		_
	_		January					None		None
	_		February		-		1	None	!	None
	_		March					None		None
	_		April					None	-	None
	_		May	_ -	 - -			None	!!!	None
	_		June					None		None
	_		July					None		None
	_		August	-				None	!	None
	_		September	-				None	!!!	None
	_		October	-	-			None		None
	_		November	-			!!!	None	!	None
	_		December	-	!		 	None	 	None
	_		_	_		_		_		_

Table 25.--Water Features--Continued

				Water	table		Ponding		Flooding	ding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
ECB:		# 		H T	H T	FT.				
))))))	i	i i	January	-			!	None		None
	_		February	-	1	-		None		None
	_		March				!!!	None	-	None
	_		April			_ -	!	None	-	None
	_		May	-	-	-	!	None		None
	_		June				!	None	!	None
	_		July				!	None	-	None
	_		August	-	1		!	None	!	None
	_		September					None	!	None
	_		October	!	 - -	 - -	 	None	-	None
	_		November				 	None	1	None
			December 			 		None	 	None
EsA: Eloso	Ω	High								
		n	January				!	None	!	None
	_		February		!			None		None
	_		March				!	None	-	None
	_		April	-	!	-	!	None	-	None
			May	-				None		None
	_		June	-	-	-		None		None
	_		July	-	-	-	1	None		None
	_		August	-	-			None		None
	_		September				 	None	1	None
	_		October			- - - -		None	-	None
			November		!			None		None
			December	!	! ! !			None	 	None
ESB:		77. 77. 77. 77. 77. 77. 77. 77. 77. 77.								
EHCOO		ver y 111911	Tanılarv		!			N C C C N		N On ON
			February	-	!			None	-	None
	_		March				!	None		None
	_		April			-		None	-	None
	_		May			-	 	None		None
	_		June				!!!	None		None
	_		July			-	!	None	-	None
	_		August	-	!	-	!!!	None	-	None
	_		September	-	-	-		None		None
	_		October			- 	 - -	None	-	None
	_		November				!	None	!	None
	_		December				!	None	!	None
	_		_			_		_		_

Table 25.--Water Features--Continued

				Water	table		Ponding		Floo	Flooding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
EvA: Esseville	Ω	High								
	_		January		!		!!!	None		None
	_		February				!	None	-	None
			March		!	!		None	-	None
			April	 	 - -		!	None	<u> </u>	None
			May		 - -	!	 	None		None
			June	 	 	 ! !	 	None	! ! !	None
			July Julianian				 	None	!	None
			August					NONG		None
			October					None		None
			November			 ! !		None		None
			December				!!!	None		None
EvB:										
Esseville	<u></u>	Very high	_			_		_		_
	_		January		!		!	None	-	None
	_		February		 - -		 - -	None	-	None
	_		March				!	None		None
	_		April		 - -		!	None	-	None
	_		May				!	None		None
	_		June		 - -		!	None	-	None
	_		July		!		 - -	None	-	None
	_		August		-		 - -	None	-	None
	_		September		!	!	!	None		None
	_		October	 - -				None	-	None
			November	!	!		 - -	None		None
			December	!	! ! !	<u> </u>		None	 	None
EVC: Fssewille		Verv high								
) 		Januarv	-			1	None		None
			February		:		!	None	-	None
	_		March	-	!	-	!!!	None		None
	_		April				!	None	-	None
	_		May	!	!		!	None	-	None
	_		June				!	None		None
	_		July				!	None	-	None
	_		August				!	None	-	None
	_		September	-	1		1	None	-	None
	_		October					None		None
	_		November		 - -			None	-	None
	_		December					None	-	None
	_		_			_		_		_

Table 25.--Water Features--Continued

Many Bigned. Egyto- Shiftee Month Types Lone Shiftee Month Types Lone Shiftee Month Types Lone Shiftee Month Types Lone Shiftee Types					Water	table		Ponding		Flooding	ding
P. Very low P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P. P.	Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	i	Frequency	Duration	Frequency
More February More Mor	Exc:		F		ET T	H T	H T				
hing————————————————————————————————————	Essevillennnnn	 	Very Low	January					None		None
hing————————————————————————————————————		_		February	-		-	!	None	-	None
hing————————————————————————————————————				March		!			None		None
High				Aprıl				! ! ! !	None		None
hing				May				 	None	 	None
hing				Ju] v				!	None	-	None
September				August	-	-			None		None
hing		_		September	-	-	-		None	-	None
hing		_		October		!			None		None
December December		_		November	-	-	-		None		None
High				December 	 		 	 	None		None
January	FaC: Fashing	Д	High								
February None None	1	_	n	January	!			!!!	None	!	None
March		_		February		!			None		None
April None None		_		March				!!	None	!	None
May		_		April	-	-	-		None		None
June June		_		May	!!!		-	!!!	None	!!!	None
July 1		_		June	1			!!!	None	!	None
August None None		_		July	!	-	-		None		None
September None None		_		August		-	_ -	 - -	None	-	None
November None		_ :		September	-		-	! ! !	None	!	None
iad				October	 	 - -	 - -	 - -	None		None
iad				November				 	None	! !	None
January C Medium January									DIO		
January None None	GoB: Goliad	 ບ 	Medium								
Ary None None None		_		January			-	1	None		None
None		_		February	-	-	-	!	None	!	None
None		_		March				1 1	None		None
st				April					None		None
st		_		May	!		-	!!!	None	!	None
st None Non		_		June		-	-	!!!	None	!	None
None		_		July	-				None	!	None
None		_		August	-	-	-	1 1	None	!	None
None		_		September		-	_ 	1	None	!	None
		_		October	 		_ 	!!!	None	!	None
None		_		November	 	-	_ -	 - 	None	-	None
		_		December	 		_ 	!!!	None	!	None

Table 25.--Water Features--Continued

				Water	table		Ponding		F100	Flooding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
Hindes		High		F. t.	H T	Ft				
		, ,	January	!		!		None	-	None
	_		February	!	-	-	!	None	-	None
	_		March	 - -			!	None		None
	_		April	 - -	 - -			None		None
			May	! ! !		!	 	None		None
			June		! ! !		 	None		None
			Angust					None		None
	- -		September	!			!	None		None
	_		October	!!!	-			None	-	None
	_		November		-	-	!!!	None		None
	_		December	! !		!!!	 	None		None
ImA:	 	 								
	 ر 	11611		!	 - -	 ! !	!			NO.
			Januar y February					N OII C		Non e
			March		 	 ! !		None		None
			Anril					N OIL		NOII -
			Mary H				!	None		None
			June				!	None	!	None
			Jul.v	! ! !		!	1	None	1	None
	- -		August			-	!	None	-	None
			September	!			!!!	None	-	None
	_		October	!	-		!	None	!	None
	_		November	!			!	None		None
			December		-		-	None		None
LaB: Tacoste		Ş								
	- -)	:	January			-		None		None
	- -		February	!			!	None		None
	_		March	!				None	-	None
	_		April	-	-	-	!	None	-	None
	_		May					None		None
	_		June					None		None
	_		July					None		None
	_		August	-				None		None
	_		September	-	-			None		None
	_		October	!			!	None		None
	_		November				!	None	:	None
	_		December				!	None	-	None
	_		_		_	_		_		_

Table 25.--Water Features--Continued

				Water	table		Ponding		Flooding	ding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				F F	F.	Ft				
LpB: Laparita	υ 	Medium								
			January	<u> </u>	!		 	None	 - -	None
			February		 	!	!	None		None
			March				 	None		None
			May					NON		None
			June		-			None		None
	_		July					None	-	None
	_		August	-			!	None		None
	_		September					None	-	None
	_		October	-	-		!!!	None	-	None
	_		November		-			None	-	None
			December	<u> </u>	 - -		 	None	 	None
LtA: Tattas		ніаһ								
			January		-		!	None		None
	_		February	-	-	-	!!!	None		None
	_		March			-	-	None	-	None
	_		April	-	-	-	!	None	!	None
	_		May	-		-	!	None		None
	_		June			-	!	None	-	None
	_		July				!	None	-	None
	_		August					None		None
	_		September		-		!	None		None
	_		October	-	 	 	 - -	None		None
			November	<u> </u>	!		 - -	None	<u> </u>	None
			December 	! ! !	 - -	!	 	None	 - -	None -
LtB:	- — - - - — -	1								
דמרנמט	 J	VELY 111911	Tannary	¦ 	:		!	N C C C N		N euch
			February		-			None	-	None
			March					None		None
	_		April	-	-	-		None		None
	_		May		-		!	None		None
	_		June		-		!	None	-	None
	_		July		1 1 1		1	None		None
	_		August	-				None		None
	_		September		-	-	!	None		None
	_		October	-			!	None		None
	_		November	-	 	- ! !		None	-	None
	_		December	-				None		None
	_		_	_	_	_		_	_	_

Table 25.--Water Features--Continued

				Water	table		Ponding		Flooding	ding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				FI T	Ft	Ft				
MaD: Mata		Medium								
			January	!	!		!	None		None
	_		February	-	!	-		None		None
			March	-	! !		 	None		None
			April	 	 - -	 	 	None	!	None
			May		 		 	None	!!!	None
			ביבי:	 		 	 	None	! !	NOIIG
			July Angret		! ! ! !		 	None		None
			Sentember		;			None	ļ	None
			October	!	!		!	None	!	None
			November					None	-	None
			December	-	-			None		None
MoA:										
Monteola	— Д	High	_			_		_		_
	_		January		!	_ -		None	1	None
	_		February	!	 - -		 	None	!	None
	_		March				!!!	None	!	None
	_		April	-	!	-		None		None
	_		May				! !	None	!	None
	_		June	-	!		1	None	1	None
	_		July					None	!	None
	_		August	-	!			None		None
			September		!			None		None
			October	 	 - -		 	None	! ! !	None
			November		!		 	None	!	None
								U CIIO		NOITO NO
Mob:		77								
HOLLOOTE		, GF Y 111-911	Taninar.		¦			- ON	ļ	- N
			February	-	-			None	!	None
	_		March					None	!	None
	_		April	-			1	None	-	None
	_		May	-	-	-		None	-	None
	_		June					None	!	None
	_		July	-		-	1	None	!	None
	_		August	!	!	-	!!!	None	!	None
	_		September	-	1		1	None	!	None
	_		October		!			None		None
	_		November		 - -	_ -	1 1	None		None
	_		December					None	!	None
	_		_			_		_		_

Table 25.--Water Features--Continued

				Mater	table		Ponding		Flooding	ing
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	FL	Ft				
NuC: Migil	 -	, T								
TABLE TO THE TOTAL	¢ 	MEGT MIII			 - 	 !	!	N N	 !	N
			January Fobsiiosii			 ! !	 	None		None
			Febiuary March			 	 	None		None
			Marcii April					None		None
			Mav			!	!	None	!	None
			June				!	None		None
	_	_	July	-	-	-		None	-	None
	_	_	August				1	None		None
	_	_	September	-	-			None		None
	_	_	October		-			None		None
	_	_	November				!	None		None
	_	_	December	-			!	None		None
OdA:	<u>ш</u>									
	ı - —		July	-	-			None	Very brief	Occasional
	_	_	August	-		-	!	None		Occasional
	_	_	September	-		-		None		Occasional
			October					None	Very brief	Occasional
OmD:										
Olmos	о —	Medium	_	_	_	_		_	_	
	_		January		 		1	None		None
	_	_	February		-			None		None
	_	_	March		-			None		None
	_	_	April		-			None	-	None
	_	_	May		1 1 1	-	1	None	-	None
	_	_	June		-			None		None
	_	_	July		1 1 1	-	1	None	-	None
	_	_	August		-			None		None
	_	_	September					None		None
	_	_	October					None		None
	_	_	November					None		None
	_	_	December		-			None		None
	_	_	_	_	_	_		_		

Table 25.--Water Features--Continued

				Water	table		Ponding		Flooding	ding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
PaB: Papalote	် ပ	High		Ft	F.	Ft				
			January	-	!			None	!	None
	_		February	-	!	-	!	None	-	None
	_		March	-		-		None		None
	_		April	_ -	-	-	!	None		None
			May		!			None		None
			June	! ! !	! ! !	 	 	None	 	None
			Andnst				 	N OII C		None
			September	!		!	1	None	-	None
			October		!		!	None	!	None
			November	-			!	None		None
	· —		December		!		!!!	None	-	None
PbA: Panalote		M ان ت								
1 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1) 	TOO H	January	-			;	None	;	None
			February				!!!	None	!	None
	_		March			!		None	!	None
	· —		April	-				None	-	None
	_		May	-		-	!	None		None
	_		June	-	-		!	None		None
	_		July	-	!	-	!	None		None
	_		August	!	!	!!!	!!!	None	!	None
	_		September	-	!		!	None	!	None
			October	 	 - -	_ ·	 - -	None		None
			November	!	!		 - -	None	1	None
					! ! !	 	 	DUON NOON	! ! !	NOIIO
Papalote	 ひ 	High								
	_		January	!	!	!!!	!!!	None	!	None
	_		February		-			None		None
	_		March	-	!		!	None	!	None
	_		April	_ -	-	-	!	None		None
	_		May	-			!	None		None
	_		June		 - -		!	None	1	None
	_		July		-			None	-	None
	_		August		-		 - -	None	1	None
	_		September					None		None
	_		October	-	!		!	None	!	None
	_		November		 - -			None		None
	_		December	-			!	None		None
	_		_			_		_		_

Table 25.--Water Features--Continued

				Water	table		Ponding		Floo	Flooding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
PcB: Parrita	ບ 	Medium								
	_		January		-		1	None		None
	_		February	!	-	-	!!!	None		None
	_		March	!		!	 	None		None
			April		 - -	_ ·	 - -	None	!	None
			May	 			 	None	 	None
				 	 - -			NOII ON	!	NOIIG
			July August			 	 	None	 	None
			September			!	!!!!	None	-	None
			October					None		None
	_		November				!	None		None
	_		December			!		None		None
PkB:										
Pavelek	— Д	High	_		_	_		_		_
	_		January	!	-	-	!!!	None	!	None
	_		February	!			 	None	1	None
	_		March	 - 				None	!	None
	_		April		-			None	-	None
	_		May			_ -	 	None	!	None
	_		June	!	-		 	None	!	None
	_		July	!			 	None	!	None
	_		August		-		 	None	-	None
	_		September		-		!!!	None	!	None
			October	!	<u> </u>	_ ·	 	None		None
			November	!		_ ·	 	None	1	None
			December		¦ 	<u> </u>	 	None	!	None -
Pavelek, severely eroded	— °	High								
			January	!		_ ·	 	None	1	None
			February	!		 	! ! !	None	!	None
			March	 	 	 ! !	 	None	! ! !	Norte
			April	 	 - -		 	None	! ! !	None
	_		May	 - -	-		 - 	None		None
	_		June	 - -			!!!	None	!	None
	_		July	 			!	None	!	None
	_		August	 - 				None	!	None
	_		September	!			1	None	!	None
	_		October	!			 	None	!	None
	_		November	 - 				None	!	None
	_		December			_ -	 	None	!	None
	_		_		_	_		_		_

Table 25.--Water Features--Continued

Pertition					Water	table		Ponding		F100	Flooding
P. P. P. P. P. P. P. P. P. P. P. P. P.	Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
					Ft	Ft	Ft				
March March More	PmC: Pernitas	υ - – –	Low								
March March Mone		_		January	!				None		None
March		_		February	-	-	-		None		None
May May May Mone Mon				March	-	-		! ! !	None	1 ! !	None
June June		_		April		-			None		None
hitas————————————————————————————————————				May	-	-		 	None	 	None
Note				Joune	 	 	 	 	None	! ! !	None
September				July August				 	None		None
1. Las				September		-			None		None
itas				October	!			1	None	!	None
titas		_		November		-	-	1	None		None
tus		_		December	-	!	-		None	-	None
January	PnB: Pernitas		ă C								
		- — · —	:)	January		!		!	None	!	None
tus		_		February	!	!			None		None
Tuse April None None		_		March			!!!		None	!!!	None
Tuse None None		_		April	-	-	-	1	None	!	None
June June		_		May				 - -	None	!	None
tus		_		June		-		! ! !	None	!	None
Lus		_		July		-		!	None	!	None
September				August	-	-	<u> </u>	! ! !	None	!!!	None
tus				September	-			 	None	! ! !	None
tus				Uctober	 - -	 	 ! !	 	None	! ! !	None
tus				November				I I I	None	I I I	None
C Low January C Low January C Low January C C Low January C C C C C C C C	PtC:										
1Y	Pettus	о С	Low	_			_				_
hry None None None				January	 - -	!	 	 - -	None		None
nber				February		!		 	None	!	None
hyber				March	 	 	 	 	None	! ! !	None
				April		 - -	!	!	None	!!!	None
NODE OF OFFICE OF OFFICE OF OFFICE OF OFFICE				May	 - -	 	 	 - -	None	 	None
None		_ 1		June		 - -			None		None
None		_		July		-		!	None	!	None
None		_		Angust				!!!	None	!	None
None		_		September		-		!	None	!	None
None		_		October		-		!	None	!	None
		_		November	-				None	!	None
		_		December	-	 - -			None		None

Table 25.--Water Features--Continued

				Water	table		Ponding		F100	Flooding
Map symbol and soil name	Hydro- logic group	Surface	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
PvC:		 		ET T	H T	H T				
F1C0sa		MO T	January	!		!		N		N
			February	1	-			None		None
	_		March			-		None		None
	_	_	April	-				None	-	None
	_		Мау	! !	!	!	!	None		None
			June		 - -		 - -	None		None
			July		<u> </u>			None		None
			August	 	<u> </u>	 	 	None	 	None
			September	 	 - -	 ! !	 	None	! ! !	None
			Uctober	! ! !	 - -	 	 - -	None	 	None
			November December	 		 		None	 	None
Px:										
Pits	<u>Д</u>	Very high	_		_	_		_		_
	_	_	January			-		None		None
	_	_	February		-		 	None		None
	_	_	March					None		None
	_	_	April	1				None		None
		_	May	!		_ - -	!	None	!!!	None
	_	_	June	!	<u> </u>		!	None	!	None
	_	_	July	!	!		!	None	1	None
	_	_	August				 - -	None		None
	_		September	!	<u> </u>		!	None		None
			October	!	 - -	_ ·	 - -	None		None
			November	 	<u> </u>	 	 	None	 	None
			December 	 	! ! !	 ! !	 	NODE	 	None -
RhC: Rhvmes		 Nealiaible								
	1 -) H H H H H H H H H H H H H H H H H H H	Taninary			 		- ON		a noN
			February		-	!	!	None	-	None
	_		March	!	:		!	None	!	None
	_		April	!	-	-	!	None	-	None
	_	_	May		-	-	!	None		None
	_	_	June			- 	!	None	!	None
	_	_	July	 			!	None	!	None
	_	_	August	!			!	None	!	None
	_	_	September					None	!	None
	_	_	October	!	-		1	None	!	None
	_	_	November	!				None		None
	_	_	December	!				None		None
	_	_	_		_	_		_		_

Table 25.--Water Features--Continued

				Water	table		Ponding		Flooding	ling
Map symbol and soil name	Hydro- logic group	Surface	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				F.	Ft.	Ft				
Rosenbrock	_ 	High								
	_	_	January					None	-	None
	_	_	February			-		None	-	None
	_		March				!	None		None
	_	_	April			-		None	-	None
	_	_	May				!	None		None
	_		June			-		None	!	None
	_	_	July			-		None	-	None
	_	_	August					None	-	None
	_	_	September				!	None	-	None
	_	_	October					None		None
	_	_	November					None		None
	_		December	!	<u> </u>		!	None	!	None
BOB.										
Rosenbrock	Ω	Very high				_		_		
	_	_	January				!	None	!	None
	_	_	February				!	None		None
	_	_	March					None	-	None
	_	_	April					None		None
	_	_	May					None		None
	_	_	June					None		None
	_	_	July					None		None
	_	_	August					None		None
	_		September					None		None
	_		October					None		None
	_	_	November					None	-	None
	_	_	December	-	-			None	-	None
RrA:										
Rosenbrock	Д — -	High								ţ
			IMAY	 -	 	 ! !	 	None		Rare
			June			 ! ! ! !	 	None	Very brief	- Kare
			Outy Angret			 		NOIIO	Very brief	ח אברת
			Sentember					None	Very brief	Rare
)		2 4

Table 25.--Water Features--Continued

				Water	table		Ponding		F100	Flooding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	F F	Ft				
SaD: Sancajo	 ບ 	Very high								
	_		January	-	<u> </u>		!	None	!	None
			February	 	 - -		 	None	-	None
			March	!!!	! !		 	None	 	None
			April	 	 - -	 	 	None	 	None
			May	! !	 		 	None	 	None
			- Journal of Little					None		NOTION
			July Angnst				 	None		N OIL
			September	-			!	None	-	None
			October	-	-		1	None		None
			November				!	None	!	None
	_		December		!		!	None		None
SeD:		:								
Sarnosa	М	Medium	_			_				
	_		January					None	!	None
	_		February	-	 - -		!!!	None	!	None
	_		March	- - - -		- 	!	None	!	None
	_		April	-	-			None	-	None
	_		May				! ! !	None	!	None
	_		June	-	 - -	_ -	1	None	!	None
	_		July	- - 		- 	 	None		None
	_		Angust	-	!	_ -	 	None	1	None
	_		September	-	-	-		None		None
	_ :		October	 	 - -	 	 	None	 - -	None
			November	!	!	 	 	None	 	None
			December	!	 		 	None	! ! !	None
shc:						- —				
Schattel	_ ე	High	_	_		_		_		_
	_		January	 - -		- - - -	!!!	None	!	None
	_		February					None		None
			March	 	 - -		 	None		None
	_		April	-	-	-	1 1 1	None	-	None
	_		May				! ! !	None	!	None
	_		June				 	None	!	None
	_		July	-	 - -	_ -	1	None	!	None
	_		August				 	None	!	None
	_		September	-		-	!	None	!	None
	_		October				!	None	!	None
	_		November	 - -		- - - -	!!!	None	!	None
	_		December				!	None	!	None
	_		_			_		_		_

Table 25. -- Water Features -- Continued

				Water	table		Ponding		Flooding	ing
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
StA: Sinton		Negligible	May June July August September	H		H		N N N N N N N N N N N N N N N N N N N	Very brief Very brief Very brief Very brief Very brief	Occasional Occasional Occasional Occasional
SxA: Sinton	м	Negligible	May June July August September					N N N N N N N N N N N N N N N N N N N	Brief Brief Brief Brief	Frequent Frequent Frequent Frequent
TcA: Tiocano	Ω	Negligible	January February March April May June		00000011	0000000	Brief Brief Brief	None None None None Cocasional		None None None None None None
UsC: Ustarents		Medium	August September October November December January February	100000	0 0 0 0 0	0.	Brief Brief	Occasional Occasional None None None None		N N N N N N N N N N N N N N N N N N N
			April May June July August September October November					N N N N N N N N N N N N N N N N N N N		N N O O D O O O O O O O O O O O O O O O

Table 25. -- Water Features -- Continued

				Water	table		Ponding		F100	Flooding
Map symbol and soil name	Hydro- logic group	Surface runoff	Month	Upper limit	Lower	Surface water depth	Duration	Frequency	Duration	Frequency
				Ft	Ft	Ft				
W: Water	 	!!!								
			Jan-Dec		-		!	None		
WaB: Woosatcho	 !	, i								
Weesalcoid	а 	× C F	Tannary	!				N O N		None
			February	-	-	-		None		None
	_		March				!!!	None		None
	_		April	-	-		1	None		None
	_		May					None		None
	_		June					None		None
	_		July				!!!	None	!	None
	_		August				!!!	None	!	None
	_		September				1	None		None
	_		October					None		None
	_		November					None		None
	_		December	!	-		 	None		None
:. Oes S										
Weesatche	B	Low						_		
	_		January	-	!			None		None
	_		February		1 1 1		!	None	-	None
	_		March				 	None		None
	_		April				1	None		None
	_		May					None		None
	_		June					None		None
	_		July				1	None		None
	_		August	-			!!!	None	!	None
	_		September	-			! !	None	!	None
	_		October		1 1 1		!	None	-	None
	_		November				!	None	!	None
			December		-		!	None		None
	_		_	_	_	_				

Table 25.--Water Features--Continued

Flooding	Frequency			None	None	None	None	None	None	None	None	None	None	None	None	
F100	Duration				!		-		!	!	!	-	!	!	!	
	Duration Frequency			None	None	None	None	None	None	None	None	None	None	None	None	
Ponding	Duration			1 1	1	 	!!!	 	 	 	!!!		!!!	 	 	
	Surface water depth	FF C													-	
Water table	Lower	Ft		-							-					
Water	Upper limit	Ft														
	Month			January	February	March	April	May	June	July	August	September	October	November	December	
	Surface runoff		Low													
	Hydro- logic group		— — ф	_	_	_	_	_	_	_	_	_	_	_	_	
	Map symbol and soil name		WeB: Weesatche													

Table 26.--Soil Features

(See text for definitions of terms used in this table. Absence of an entry indicates that the feature is not a concern or that data were not estimated.)

Map symbol		Restric	tive layer		Risk of	corrosion
and soil name	 Kind	Depth to top		 Hardness	 Uncoated steel	 Concrete
Anc: Annarose	Bedrock (densic)	In 40-60	In	 Noncemented	Low	 Low
Buchel				 	 High	 Low
BfA: Buchel				 	 High	 Low
CaB: Campbellton	 Bedrock (densic)	40-60		 Noncemented 	 High	 Low
CaC: Campbellton	 Bedrock (densic)	40-60		 Noncemented 	 High 	 Low
eB: Choke	 Bedrock (densic)	 60-80	 	 Noncemented 	 Moderate 	 Moderate
CeC: Choke	 Bedrock (densic)	 60-80	 	 Noncemented 	 Moderate 	 Moderate
CkA: Clareville	 	i 	 	 	 High	 Low
CkB: Clareville	i 	i 	 	 	 High 	 Low
dnA: Condido	 Petrocalcic	1 10-20	1-12	 Strongly cemented 	 High 	 Low
	Bedrock (densic)	20-80		Noncemented	 	i I
oB: Conquista	i 	i 	 	 	 High	 Low
oG: Conquista		ļ		 	 High	 Low
tB: Cotulla		ļ		 	 High	 Moderate
'yA: Coy		ļ		 	 High	 Low
'уВ: Соу		i 		 	 High 	 Low
DAM: Dams	 			 	 	
nA: Danjer				 	 High 	 Low
nB: Danjer				 	 High 	 Low
cB: Ecleto	 Bedrock (paralithic)	1 10-20	 	 Weakly cemented 	 High 	 Low

Table 26.--Soil Features--Continued

Map symbol		Restric	tive layer		Risk of	corrosion
and soil name	 Kind	Depth to top	 Thickness	 Hardness	Uncoated steel	 Concrete
	l	-	I In	 	 	
EsA: Eloso	 Bedrock (densic)	1 20-40		 Noncemented	 High	 Low
EsB: Eloso	 Bedrock (densic)	20-40		 Noncemented	 High	 Low
EvA: Esseville	 			 Noncemented	 High	
ESSEVIIIE		20-40		Noncemented	 midii	Low
EvB: Esseville	 Bedrock (densic)	1 20-40		 Noncemented	 High	 Low
IvC: Esseville	 Bedrock (densic)	1 20-40		 Noncemented	 High	 Low
			İ			į
CxC: Esseville	 Bedrock (densic)	20-40		 Noncemented	 High	 Moderate
~aC:		1				
Fashing	Bedrock (densic)	1 10-20		 Noncemented	ı High	Low
GoB:	 	1		 	 	
Goliad	Petrocalcic	20-40	5-20	 Indurated	 High	Low
HnD:		1		 	 	
Hindes					Moderate	Low
mA:				 	 	
Imogene					High	Moderate
⊿aB:				 	 	
Lacoste	Petrocalcic	10-20	4-7	Strongly cemented	Moderate	Low
pB:					! 	İ
Laparita				 	High 	Low
utA:	į	į	İ			
Lattas	 				High 	Low
tB: Lattas	 !			 	 High	 Low
Lactas						
IaD: Mata	 Bedrock (densic)	 40-60		 Noncemented	 High	 Low
			İ			
MoA: Monteola	 			 	 High	 Low
	į	į	İ			į
MoB: Monteola				 	। ∣High	Low
JuC:		1				
Nusil					 Low	 Moderate
odA:				 	 	
Odem					 Moderate	Low
OmD:				 	 	
Olmos	Petrocalcic	10-20	4-12	 Indurated	 High	Low
°aB:				 	 	
Papalote					 High	Low
PbA:				I 	 	
Papalote	i		i		High	Low

Table 26.--Soil Features--Continued

Map symbol	 	Restric	tive layer		Risk of	corrosion
and soil name	 Kind	Depth to top	 Thickness	 Hardness	Uncoated steel	Concrete
	 	In	In	 	 	
Papalote	 !			 	' High 	Low
°CB: Parrita	 Petrocalcic	10-20	4-9	 Indurated 	 High 	 Low
kB: Pavelek	 Petrocalcic	10-20	1-8	 Strongly cemented	 High	Low
	Bedrock (densic)	40-60		 Noncemented	 	
Pavelek, severely eroded	 Petrocalcic	 10-20	 1-3	 Strongly cemented	 High	 Low
	 Bedrock (densic)	 40-60		 Noncemented	 	
PmC:	 	i I	i I	 -	 	
Pernitas	 !	i		 	 High 	Low
nB: Pernitas	 		 	 	 High 	 Low
PtC: Pettus	 	 	 	 	 Moderate 	 Low
Picosa	 Bedrock (densic)	1 10-20	 	 Noncemented 	 Moderate 	 Low
Pits	 		 	 	 High 	 Low
RhC: Rhymes	 			 	 Low	 Moderate
Rosenbrock	 Bedrock (densic)	1 40-60	 	 Noncemented 	 High 	 Low
Rosenbrock	 Bedrock (densic)	 40-60	 	 Noncemented 	 High 	 Low
RrA: Rosenbrock	 Bedrock (densic)	1 40-60	 	 Noncemented 	 High 	 Low
aD: Sancajo	 Petrocalcic	1 10-20	 4-9	 Indurated	 Low 	 Low
	Bedrock (densic)	20-40	i	Noncemented	 	i I
eD: Sarnosa	 			 	 Moderate 	 Low
ShC: Schattel	 Bedrock (densic)	40-60		 Noncemented 	 High	 Low
tA: Sinton	 		 	 	 Moderate 	 Low
xA: Sinton	 		 	 	 Moderate 	 Low
CA:	 			 	 High	 Low

Table 26.--Soil Features--Continued

Map symbol		Restric	ctive layer		Risk of	corrosion
and soil name		Depth	T T		Uncoated	1
	Kind	to top	Thickness	Hardness	steel	Concrete
		 In				-
UsC:						
Ustarents					High	Low
W:		l I				
Water						
		i	i i		i	i
WaB:		1	1			1
Weesatche					High	Low
T		ļ				
WaC: Weesatche						 T
weesatche					High	Low
WeB:		i	i i			
Weesatche		i			High	Low
1		1	1			1
I			1		I	

Table 27.--Physical Analyses of Selected Soils

(The abbreviation "COLE" means coefficient of linear extensibility. Analysis by USDA-NRCS, National Soil Survey Laboratory, Lincoln, Nebraska. Dashes indicate that data were not available.)

-			Particle-size distribution Water								Bulk		
					Sand		,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,				content	density	
Soil name and sample number	Depth	Horizon	Very coarse (2.0-1.0 mm)	Coarse (1.0- 0.5mm)	Medium (0.5- 0.25mm)	Fine (0.25- 0.1 mm)	Very fine (0.1- 0.05 mm)	Total (2.0- 0.05 mm)	Silt (0.05- 0.002 mm)	Clay (<0.02 mm)	1/3- bar	1/3- bar	COLE (Whole soil)
	<u>In</u>						I	Pct					cm/cm
Annarose (1) S91TX-297-003	0-9 9-16 16-25 25-35 35-43 43-50 50-69 69-80	A Bw1 Bw2 Bk1 Bk2 BCk Cr1 Cr2	0.4 0.4 0.2 0.5 tr tr	0.2 0.3 0.4 0.4 0.1 0.01 tr	3.5 3.1 3.4 3.5 2.2 2.7 1.9 3.1	43.2 33.1 32.0 32.9 44.6 46.7 47.5 52.6	19.0 19.2 17.4 16.4 19.6 19.0 26.9 24.6	66.3 56.1 53.4 53.7 66.5 68.5 76.3 80.3	15.4 19.5 23.3 23.2 19.2 18.4 12.5 9.5	18.3 24.4 23.3 23.1 14.3 13.1 11.2	14.7 20.5 19.4 19.3 14.9 15.5 13.5	1.46 1.22 1.34 1.39 1.47 1.51 1.65	0.02 0.02 0.02 0.03 0.01 0.01 0.01
Buchel (1) S92TX-297-005	0-8 8-22 22-32 32-42 42-63 63-74 74-80	Ap Bss1 Bss2 Bss3 Bss4 Bss5 BC	tr tr 0.1 tr 0.1 0.1	0.1 tr 0.1 tr tr 0.1 0.1	0.8 0.7 0.7 0.8 0.9 1.0	6.1 5.1 5.5 6.1 7.4 7.7 9.7	9.3 9.0 8.7 8.9 7.6 9.3 9.7	16.3 14.8 15.1 15.8 16.0 18.2 20.6	36.8 35.0 34.8 33.1 30.6 25.5 25.2	46.9 50.2 50.1 51.1 53.4 56.3 54.2	40.3 39.7 37.6 38.2 37.3 42.1 43.1	1.21 1.23 1.25 1.24 1.23 1.20	0.11 0.12 0.12 0.13 0.13 0.13
Choke (1) S91TX-297-005	0-4 4-10 10-16 16-24 24-34 34-48 48-58 58-73 73-80	A1 A2 Bw1 Bw2 Bk1 Bk2 Bk3 BCk 2Cr	0.2 0.2 0.2 0.4 0.1 0.8 1.3 8.3	0.4 0.4 0.5 0.4 0.3 0.8 1.4 1.1	1.0 0.8 1.0 0.6 0.6 0.9 2.0 2.0	4.7 3.8 4.4 3.7 2.2 3.4 7.9 16.5 5.2	11.2 8.4 8.4 7.5 6.5 9.1 18.4 28.2 14.3	17.5 13.6 14.5 12.6 9.7 15.0 31.0 48.1 22.6	46.7 51.7 51.5 54.3 59.3 60.2 48.9 37.7 57.4	35.8 34.7 34.0 33.1 31.0 24.8 20.1 14.2 20.0	39.8 39.3 38.0 34.4 36.3 29.9 25.8 32.2	1.04 1.01 1.05 1.09 1.06 1.16 1.23	0.06 0.07 0.07 0.05 0.05 0.02 0.01
Danjer (1,2) S92TX-297-003	0-6 6-15 15-27 27-45 45-59 59-71 71-80	A1 A2 Bss1 Bss2 Bw1 Bw2 Bw3	0.6 0.5 0.5 0.3 0.2 0.1	0.4 0.6 0.7 0.4 0.3 0.3	2.0 2.1 2.0 1.8 1.4 3.2 4.8	10.1 7.2 7.2 6.7 6.8 16.0 25.2	6.1 4.4 4.3 4.7 4.8 7.2 10.4	19.2 14.8 14.7 13.9 13.5 26.8 40.7	31.0 33.1 33.5 37.7 35.4 31.1 24.6	49.8 52.1 51.8 48.4 51.1 42.1 34.7	26.2 27.9 29.3 30.3 29.6 25.9 24.5	1.22 1.39 1.41 1.41 1.39 1.47	0.06 0.08 0.08 0.08 0.07 0.06
Esseville (1) S92TX-297-004	0-5 5-15 15-18 18-32 32-36 36-53 53-60 60-80	A Bss Bkyssz1 Bkyssz2 Bcssyz Cyz1 Cyz2 Cyz3	0.5 0.1 0.2 0.2 0.1 0.1 tr	0.6 0.4 0.3 0.2 0.2 0.2	1.5 1.4 1.0 0.9 0.4 0.4 0.5	12.1 9.6 8.3 6.4 1.9 1.4 0.6	8.2 8.4 7.0 5.9 1.9 1.7 1.4	22.9 19.9 16.9 13.7 4.5 3.8 2.8 2.6	23.6 23.2 25.7 29.5 25.0 18.7 38.3 38.4	53.5 56.9 57.4 56.8 70.5 77.5 58.9 59.0	43.9 43.9 41.2 41.4 51.5 54.5 43.3 49.8	1.09 1.14 1.19 1.19 1.08 1.04 1.17	0.15 0.18 0.15 0.15 0.20 0.21 0.16 0.21
Lacoste (1) S91TX-297-006	0-4 4-10 10-13 13-22	A Bt1 Bt2 Bkm	tr tr tr	0.2 0.2 0.2	9.4 9.8 7.4	53.0 48.5 37.2	14.0 13.0 12.4	76.6 71.5 57.2	12.9 12.2 13.7	10.5 16.3 29.1	8.2 9.1 17.2 	1.67 1.59 1.36	<0.01 0.01 0.04
Lattas (1) S91TX-297-010	0-6 6-14 14-24 24-36 36-45 45-52 52-64 64-80	Ap A Bss1 Bss2 Bss3 BCssk1 BCssk2 BCky1	0.4 0.2 0.5 0.1 0.3 0.1 0.1	0.8 0.8 1.1 0.9 1.0 0.6 0.8	6.1 5.5 6.0 5.3 4.6 4.5 3.8 4.1	20.5 17.5 15.8 15.9 13.0 12.4 11.9 13.2	10.8 9.9 8.6 7.3 7.8 7.9 7.1	38.6 33.9 32.0 29.5 26.7 25.9 24.3 25.3	19.3 20.4 20.5 21.3 21.7 22.2 22.6 24.7	42.1 45.7 47.5 49.2 51.6 51.9 53.1 50.0	29.4 30.5 35.1 37.9 39.9 38.8 37.4 32.4	1.31 1.35 1.27 1.27 1.23 1.22 1.25 1.33	0.06 0.10 0.14 0.15 0.17 0.18 0.13

See footnotes at end of table

Table 27.--Physical Analyses of Selected Soils--Continued

(The abbreviation "COLE" means coefficient of linear extensibility. Analysis by USDA-NRCS, National Soil Survey Laboratory, Lincoln, Nebraska. Dashes indicate that data were not available.)

					Particle-	-size dis	tribution	ı			Water	Bulk	
					Sand						content	density	
Soil name and sample number	Depth	Horizon	Very coarse (2.0-1.0 mm)	Coarse (1.0- 0.5mm)	Medium (0.5- 0.25mm)	Fine (0.25- 0.1 mm)	Very fine (0.1- 0.05 mm)	Total (2.0- 0.05 mm)	Silt (0.05- 0.002 mm)	Clay (<0.02 mm)	1/3- bar	1/3- bar	COLE (Whole soil)
	In						I	ct				•	cm/cm
Olmos (1) S91TX-297-001	0-8 8-18 18-30 30-41 41-51 51-61	A1 A2 Bkm BCk1 BCk2 BCk3	3.2 10.9 6.8 7.8 10.6 7.6	3.1 9.7 12.9 14.0 11.0	11.8 10.3 16.2 15.3 12.4 9.4	36.6 14.8 12.2 11.0 7.9 6.4	14.0 7.1 5.4 4.4 3.8 3.0	68.7 52.8 53.5 52.5 45.7 36.9	16.8 26.7 36.6 39.3 48.3 56.8	14.5 20.5 9.9 8.2 6.0 6.3	27.7 24.5 29.3 26.2 25.5 30.1	1.03 1.51 1.34 1.39 1.36 1.26	0.02 <0.01 <0.01
	61-75 75-80	BCk4 2BCks	10.3	11.2	9.9	13.4	7.3 12.0	52.1 65.7	42.3	5.6	13.1	1.80	
Pernitas (1) S91TX-297-002	0-7 7-14 14-20 20-26 26-36 36-48 48-59 59-80	Ap Bt1 Bt2 Bt3 Bt4 Bk1 Bk2 Bk3	0.1 0.2 0.4 0.5 1.1 1.2 0.8 0.5	1.1 1.1 1.6 1.5 1.5 0.7 0.8	15.3 12.3 12.6 11.2 9.2 6.6 7.1 8.0	36.5 27.3 26.3 24.4 23.0 16.1 17.3 22.4	14.3 15.4 13.0 12.1 11.6 11.2 11.2	67.3 56.3 53.4 49.8 46.4 36.6 37.1 45.9	12.8 14.3 15.4 17.4 17.9 32.7 34.5 28.0	19.9 29.4 31.2 32.8 35.7 30.7 28.4 26.1	18.1 25.8 20.4 26.6 23.2 20.7 21.6	1.43 1.58 1.46 1.40 1.29 1.38 1.47	0.03 0.08 0.04 0.05 0.03 0.02 0.04
Sarnosa (1) S91TX-297-004	0-6 6-13 13-22 22-34 34-48 48-57 57-68 68-80	Ap Bw1 Bw2 Bw3 Bk1 Bk2 Bk3 Bk4	0.4 0.5 0.6 0.6 1.2 0.7 1.4 0.4	1.5 1.6 2.0 1.8 2.1 2.4 2.2	16.9 14.4 13.9 12.3 13.1 12.8 15.5	42.4 42.5 38.8 37.5 33.0 35.4 38.9 34.4	14.9 13.4 12.4 14.7 13.5 13.8 12.5	76.1 72.4 67.7 66.9 62.9 65.1 70.5 63.1	8.2 9.4 10.5 11.5 14.5 14.6 11.7	15.7 18.2 21.8 21.6 22.6 20.3 17.8 21.5	15.9 17.2 18.0 17.6 17.5 15.7 16.6 17.7	1.51 1.52 1.40 1.41 1.43 1.49 1.52	0.02 0.02 0.02 0.02 0.02 0.02 0.02 0.03
Tiocano (1) S92TX-297-002	0-8 8-21 21-38 38-50 50-59 59-70 70-80	A Bss1 Bss2 Bss3 Bss4 Bk1 Bk2	0.1 0.2 tr tr 0.5	0.2 0.2 0.2 0.2 0.2 0.9 1.4	3.6 3.0 3.6 3.9 3.6 2.8 4.1	26.6 25.2 24.9 25.6 25.0 22.0	8.8 8.1 7.7 8.7 8.3 8.3 5.9	39.3 36.7 36.4 38.4 37.1 34.5 30.3	18.5 17.6 16.8 15.6 17.1 18.1 41.4	42.2 45.7 46.8 46.0 45.8 47.4 28.3	27.6 31.3 32.4 33.0 33.5 24.7 18.4	1.40 1.36 1.34 1.31 1.31 1.27	0.08 0.09 0.10 0.09 0.08 0.08
Weesatche (1) S91TX-297-007	0-6 6-9 9-16 16-22 22-29 29-37 37-52 52-71 71-80	Ap A Bt1 Bt2 Bt3 Btk Bk1 Bk2 Bk3	0.1 tr tr 0.1 0.3 1.1 1.5	0.2 0.2 0.3 0.3 0.3 0.5 0.9 1.4	6.2 6.0 6.4 5.4 5.1 4.3 2.6 2.8 2.6	37.9 36.7 35.0 37.0 33.1 26.5 18.0 14.8 13.2	14.6 13.6 13.0 11.4 13.0 11.9 9.1 6.7 7.2	59.0 56.5 54.7 54.1 51.6 43.5 31.7 27.2 25.8	17.0 16.4 15.7 16.1 17.0 21.2 36.9 45.6 49.0	24.0 27.1 29.6 29.8 31.4 35.3 31.4 27.2 25.2	22.0 23.4 24.6 22.6 21.1 20.6 26.9 18.6 19.4	1.33 1.27 1.31 1.41 1.50 1.46 1.23 1.51	0.03 0.04 0.05 0.05 0.05 0.04 0.02 0.01

⁽¹⁾ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

⁽²⁾ Pedon sampled has different surface texture than the map unit in which it is located.

Table 28.--Chemical Analyses of Selected Soils

Analysis by USDA-NRCS, National Soil Survey Laboratory, Lincoln, Nebraska.(Dashes indicate that analyses were not made.)

			Ext	ractab	le bas	es	Cation					
Soil name and sample number	Depth	Horizon	Ca	Mq	K	Na	Exchange Capacity	Base satura- tion	Organic carbon	pH 1:1 (soil:w ater)	Electric Conductivity	Sodium adsorption ratio (SAR)
			Ca	Mg	V	Na						
	In			N	1eq/100) gm		Pct	Pct	рН	(mmhos/cm)	
Annarose (1)	0-9	A		1.0	0.2	0.1	15.1	100	0.76	8.2	===	
S91TX-297-003	9-16	Bw1		1.1	0.2	0.2	16.4	100	0.74	8.2		
	16-25	Bw2		1.2	0.2	0.1	17.1	100	0.53	8.2		
	25-35	Bk1		1.5	0.2	0.2	18.3	100	0.34	8.2		
	35-43	Bk2		1.7	0.2	0.1	16.3	100	0.12	8.3		
	43-50	BCk		1.8	0.1	0.2	15.4	100	0.08	8.3		
	50-69 69-80	Cr1 Cr2		2.2	0.1	0.3	15.9 14.6	100 100	0.03	8.1 8.6		
Buchel (1) S92TX-297-005	0-8 8-22	Ap Bss1		1.4	2.3	0.3	38.9 38.8	100 100	1.02	8.1 8.2	0.61 0.42	tr 1.0
3921A-297-003	22-32	Bss1 Bss2		1.1	0.9	1.7	39.4	100	0.72	8.4	0.42	2.0
	32-42	Bss3		1.0	1.0	2.7	38.8	100	0.78	8.5	0.54	3.0
	42-63	Bss4		1.1	1.0	4.2	40.0	100	0.58	8.6	0.64	5.0
	63-74	Bss5		1.2	0.9	4.9	38.7	100	0.40	8.7	0.71	6.0
	74-80	BC		1.1	0.9	5.0	36.1	100	0.26	8.6	0.74	5.0
Choke (1)	0-4	A1					37.7	100	1.97	7.9	0.69	tr
S91TX-297-005	4-10	A2					39.6	100	1.34	7.9	0.61	tr
	10-16	Bw1					37.4	100	1.95	7.9	0.85	tr
	16-24	Bw2					35.4	100	0.77	8.0	0.49	tr
	24-34	Bk1					31.1	100	0.48	8.1	0.45	tr
	34-48	Bk2					23.3	100	0.27	8.0	1.27	tr
	48-58 58-73	Bk3 BCk					21.3 19.7	100 100	0.18 0.11	7.7 7.5	4.32 6.03	0.1
	73-80	2Cr					34.0	100	0.09	7.6	9.37	0.4
Danjer (1,2)	0-6	A1		3.2	2.1	0.3	28.3	100	2.53	8.0	0.85	tr
S92TX-297-003	6-15	A2		4.7	0.9	0.8	25.3	100	1.25	8.3	0.50	2
	15-27	Bss1		6.4	0.7	1.8	23.9	100	0.85	8.6	0.63	4
	27-45	Bss2		7.5	0.9	4.1	22.6	100	0.74	8.3	2.00	9
	45-59	Bw1		7.4	1.1	5.7	28.3	100	0.34	8.2	3.11	11
	59-71	Bw2		5.5	0.6	4.6	25.8	100	0.19	8.2	2.92	11
	71-80	Bw3		5.9	0.8	5.3	25.9	100	0.17	8.3	3.66	13
Esseville (1)	0-5	A		1.7	2.1	1.4	41.2	100	1.79	8.2	0.82	2
S92TX-297-004	5-15	Bss		1.3	1.1	6.5	42.3	100	1.13	8.3	1.19	8
	15-18 18-32	Bkyssz1		1.2	1.0	9.6 15.8	57.0 37.2	100 100	0.89	7.8 7.8	5.32 8.31	11 18
	32-36	Bkyssz2 Bcssyz		1.4	1.1	23.0	41.8	100	0.22	7.7	9.43	21
	36-53	Cyz1		1.6	1.3	25.4	47.3	100	0.17	7.7	9.87	20
	53-60	Cyz2	83.3	1.2	1.1	21.0	40.8	100	0.1	7.4	9.71	20
	60-80	Cyz3	160.8	1.5	1.6	25.2	49.0	100	0.01	7.4	9.73	21
Lacoste (1)	0-4	A	5.3	0.6	0.2	0.2	5.9	100	0.55	6.2		
S91TX-297-006	4-10	Bt1	6.9	0.8	0.1	0.1	8.0	99	0.53	6.2		
	10-13	Bt2	15.9	1.2	0.3	0.4	16.6	100	0.95	6.6		
	13-22	Bkm										
Lattas (1)	0-6	Ap		3.6	1.1	0.8	19.4	100	0.97	7.9	1.03	1
S91TX-297-010	6-14	A		5.4	0.9	2.1	35.1	100	0.64	8.1	0.55	3
	14-24	Bss1		5.6	0.6	4.0	34.1	100	0.61	8.3	0.66	8
	24-36 36-45	Bss2 Bss3		6.6 7.7	0.9	6.5 9.4	36.4 35.1	100 100	0.53	8.3 8.2	1.02	10 11
	45-52	BCssk1		6.1	0.9	9.4	32.7	100	0.43	8.2	2.38	14
	52-64	BCssk1 BCssk2		5.4	1.0	9.2	32.7	100	0.08	7.7	5.12	12
	64-80	BCky1		5.9	0.8	10.5	31.3	100	0.04	7.8	5.27	13
				l		l	l					l

See footnotes at end of table

Table 28.--Chemical Analyses of Selected Soils--Continued

Solitame and sample number Depth Horizon Ca Mg K Na Na Sacracity Sacra				Ext	ractab	le bas	es	Cation	Base		рн 1:1		Sodium
Olmos (1)	Soil name and sample number	Depth	Horizon	Ca	Mg	K	Na		satura-	Organic carbon	(soil:w		adsorption
SPITX-297-001 S-18		In			M	eq/100	gm		Pct	Pct	рН	(mmhos/cm)	
18-30 Bbm 0.4 0.2 3.7 100 0.18 8.3 0.18 0.5 0.2 4.9 100 0.13 8.4 0.17 0.5 0.2 4.6 100 0.10 8.5 0.16 0.5 0.2 4.6 100 0.10 8.5 0.16 0.5 0.3 5.0 100 0.10 8.5 0.16 0.5 0.8 0.3 5.0 100 0.10 8.5 0.16 0.5 0.8 0.3 5.0 100 0.10 8.5 0.16 0.5 0.8 0.7 5.0 100 0.10 8.5 0.16 0.5 0.8	Olmos (1)	0-8	A1		0.9	0.2	0.1	14.5	100	2.64	7.6	0.82	tr
30-41 BCk1 0.5 0.2 4.9 100 0.13 8.4 0.17 1.5 BCk2 0.8 0.2 4.6 100 0.10 8.5 0.16 0.16 1.5 BCk3 1.0 tr 0.3 5.0 100 0.10 8.3 0.19 1.6 1.7 0.1 1.1 6.8 100 0.10 8.3 0.19 1.6 1.67 5.0 75-80 2BCks 2.8 1.0 3.5 7.5 100 0.09 8.3 4.03 14.0 14.0 14.0 14.0 1.1	S91TX-297-001	8-18	A2		0.4	0.1	0.1	9.4	100	1.44	8.0	0.59	tr
Head Head													
Si-61 BCk3 1.0 tr 0.3 5.0 100 0.10 8.3 0.19 61-75 BCk4 1.7 0.1 1.1 6.8 100 0.09 8.2 1.67 5.0 14.0 1													
Service Serv													
Pernitas (1) 0-7 Ap													
Pernitas (1) 0-7 Ap 1.5 1.0 0.1 17.6 100 1.08 8.0 0.63 tr S1TX-297-002 7-14 Btl 1.4 0.4 0.2 22.0 100 0.93 8.0 0.24 1.2 0.4 0.2 21.1 100 0.74 8.1 0.24 1.2 0.4 0.2 21.1 100 0.56 8.2 0.22 1.2 0.4 0.1 21.1 100 0.56 8.2 0.22 1.2 0.4 0.1 22.7 100 0.50 8.1 0.57 tr S1 0.4 8.5 8.5 8.2 0.22 1.2 0.4 0.1 22.7 100 0.50 8.1 0.57 tr S1 0.4 8.5 8.5 8.2 0.22 1.2 0.2 0.2 0.2 12.8 100 0.17 8.1 0.70 1.0 5.9 8.2 0.93 tr S1 0.5 8.2 0.93					-								
S91TX-297-002		75-80	2BCks		2.8	1.0	3.5	7.5	100	0.09	8.3	4.03	14.0
14-20		0 ,											
20-26	S91TX-297-002												
26-36 Bt4 1.3 0.4 0.1 22.7 100 0.50 8.1 0.57 tr 36-48 Bk1 1.1 0.2 0.1 13.4 100 0.30 8.2 0.93 tr 48-59 Bk2 2.0 0.2 0.2 12.8 100 0.17 8.1 0.70 1.0 59-80 Bk3 3.4 0.2 0.3 13.8 100 0.11 8.2 0.21 Sarnosa (1) 0-6 Ap 1.4 0.6 12.2 100 1.14 8.0 0.67 1.0 S91TX-297-004 6-13 Bw1 1.7 0.3 13.5 100 1.07 8.0 0.69 tr 1.7 0.3 13.5 100 0.64 8.0 0.69 tr 22-34 Bw3 1.8 0.1 12.4 100 0.41 7.8 1.22 tr 34-48 Bk1 1.8 0.1 12.4 100 0.41 7.8 1.22 tr 48-57 Bk2 1.5 0.2 13.5 100 0.34 8.1 0.20 48-57 Bk2 1.5 0.2 12.4 100 0.3 8.2 0.21 Tiocano (1) 0-8 Bk3 1.2 0.1 12.4 100 0.3 8.2 0.21 S92TX-297-002 8-21 Bss1 19.9 5.3 1.4 0.2 28.8 93 0.66 7.1 38-50 Bss3 18.9 5.2 1.5 0.3 26.5 98 0.35 7.3 Weesatche (1) 0-6 Ap 18.3 1.8 1.2 0.2 21.7 99 0.22 7.7 38-50 Bss4 19.3 5.3 1.6 0.3 26.9 99 0.22 7.7 Weesatche (1) 0-6 Ap 18.3 1.8 1.2 0.2 21.7 99 1.81 7.3 1.23 tr S91TX-297-007 6-9 A 21.1 1.6 0.8 0.2 21.7 99 1.81 7.3 1.23 tr S91TX-297-007 8-16 Bt2 21.4 1.7 0.3 0.1 22.5 100 0.84 7.9 0.44 tr Weesatche (1) 0-6 Ap 18.3 1.8 1.2 0.2 21.7 99 1.81 7.3 1.23 tr S91TX-297-007 8-1 Bt2 21.4 1.7 0.3 0.1 22.5 100 0.84 7.9 0.44 tr 22-29 Bt3 2.3 0.3 0.2 20.0 100 0.84 7.9 0.44 tr 22-29 Bt3 2.3 0.3 0.2 20.0 100 0.66 8.1 0.24 23-50 50.5 0.2 11.6 100 0.88 8.2 0.21 25-71 Bk2 2.4 0.4 0.2 19.1 100 0.86 8.2 0.21 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.21 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.21 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.21 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.21 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.21 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.21 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.22 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.22 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.22 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.22 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.22 25-71 Bk2 2.5 0.4 0.3 9.0 100 0.06 88.2 0.22			-		-								
36-48													
Sarnosa (1)			-										
Sarnosa (1)													
S91TX-297-004 6-13 Bw1													
S91TX-297-004 6-13 Bw1 1.7 0.3 13.5 100 1.07 8.0 0.69 tr 1.9 0.2 13.5 100 0.64 8.0 0.69 tr 22-34 Bw3 1.8 0.1 12.4 100 0.41 7.8 1.22 tr 34-48 Bk1 1.8 0.2 13.1 100 0.34 8.1 0.20 48-57 Bk2 1.5 0.2 12.0 100 0.03 8.2 0.21 57-68 Bk3 1.6 0.2 12.4 100 0.15 8.2 0.19 1.6 0.2 12.4 100 0.21 8.2 0.19 Tiocano (1) 0-8 A 17.8 4.2 1.6 0.2 27.0 88 1.94 8.2 S92TX-297-002 8-21 Bss1 19.9 5.3 1.4 0.2 28.8 93 0.66 7.1 38-50 Bss3 18.9 5.2 1.5 0.3 26.5 98 0.35 7.3 59-70 Bk1 5.7 1.5 0.5 26.0 100 0.10 8.2 0.52 1.0 70-80 Bk2 4.2 0.9 0.5 16.7 100 0.07 8.3 Weesatche (1) 0-6 Ap 18.3 1.8 1.2 0.2 21.7 99 1.81 7.3 1.23 tr 16-22 Bt2 21.4 1.7 0.3 0.1 22.5 100 0.84 7.9 0.44 tr 16-22 Bt2 21.4 1.7 0.3 0.1 22.5 100 0.86 8.1 0.24 29-37 Btk 2.4 0.4 0.2 19.1 100 0.46 8.3 0.22 37-52 Bk1 2.5 0.4 0.3 9.0 100 0.16 8.2 0.52 1.0 1.5 0	- (4)	0.5	_					40.0	400			0.55	
13-22 Bw2 1.9 0.2 13.5 100 0.64 8.0 0.69 tr	,				-								
22-34	S911X-297-004												
34-48													
## A8-57 Bk2 1.5 0.2 12.0 100 0.03 8.2 0.21 57-68 Bk3 1.2 0.1 10.8 100 0.15 8.2 0.19 1.6 68-80 Bk4 1.6 0.2 12.4 100 0.21 8.2 0.19 1.5 1.6 0.2 12.4 100 0.21 8.2 0.19 1.5 1.6 0.2 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5 1.0 1.5													
Tiocano (1)													
Tiocano (1) S92TX-297-002 B-21 Bss1 19.9 S-3 1.4 0.2 28.8 93 0.66 7.1 38-50 Bss3 18.9 S-2 19.5 S-3 1.7 0.4 28.1 96 0.53 7.1 50-59 Bss4 19.3 S-3 1.6 0.3 26.5 98 0.35 7.3 59-70 Bk1 5-7 1.5 0.5 0.5 0.5 0.5 0.5 0.6 0.7 0.0 0.10 0.10 0.2 21.7 0.8 0.6 0.7 0.0 0.10 0.10 0.10 0.10 0.10 0.10 0		57-68	Bk3		1.2	0.1		10.8	100	0.15			
S92TX-297-002 8-21		68-80	Bk4		1.6	0.2		12.4	100	0.21	8.2	0.19	
S92TX-297-002 8-21	Tiocano (1)	0-8	A	17 8	4 2	1.6	0.2	27 0	88	1 94	8 2	===	
21-38													
Solution Solution		21-38	Bss2	19.5	5.3	1.7	0.4	28.1	96		7.1		
Second Column		38-50	Bss3	18.9	5.2	1.5	0.3	26.5	98	0.35	7.3		
To-80 Bk2 4.2 0.9 0.5 16.7 100 0.07 8.3 Weesatche (1) 0-6 Ap 18.3 1.8 1.2 0.2 21.7 99 1.81 7.3 1.23 tr S91TX-297-007 6-9 A 21.1 1.6 0.8 0.2 11.4 100 1.54 7.8 0.70 tr 9-16 Bt1 27.5 1.6 0.6 0.2 23.8 100 1.30 7.7 0.85 tr 16-22 Bt2 21.4 1.7 0.3 0.1 22.5 100 0.84 7.9 0.44 tr 22-29 Bt3 2.3 0.3 0.2 20.0 100 0.66 8.1 0.24 29-37 Btk 2.4 0.4 0.2 19.1 100 0.46 8.3 0.22 37-52 Bk1 2.0 0.5 0.2 11.6 100 0.28 8.2 0.21 52-71 Bk2 2.5 0.4 0.3 9.0 100 0.16 8.2 0.62 1.0			Bss4					26.9	99				
Weesatche (1)													
S91TX-297-007 6-9 A 21.1 1.6 0.8 0.2 11.4 100 1.54 7.8 0.70 tr 9-16 Bt1 27.5 1.6 0.6 0.2 23.8 100 1.30 7.7 0.85 tr 16-22 Bt2 21.4 1.7 0.3 0.1 22.5 100 0.84 7.9 0.44 tr 22-29 Bt3 2.3 0.3 0.2 20.0 100 0.66 8.1 0.24 29-37 Btk 2.4 0.4 0.2 19.1 100 0.46 8.3 0.22 37-52 Bk1 2.0 0.5 0.2 11.6 100 0.28 8.2 0.21 52-71 Bk2 2.5 0.4 0.3 9.0 100 0.16 8.2 0.62 1.0		70-80	Bk2		4.2	0.9	0.5	16.7	100	0.07	8.3		
9-16 Bt1 27.5 1.6 0.6 0.2 23.8 100 1.30 7.7 0.85 tr 16-22 Bt2 21.4 1.7 0.3 0.1 22.5 100 0.84 7.9 0.44 tr 22-29 Bt3 2.3 0.3 0.2 20.0 100 0.66 8.1 0.24 29-37 Btk 2.4 0.4 0.2 19.1 100 0.46 8.3 0.22 37-52 Bk1 2.0 0.5 0.2 11.6 100 0.28 8.2 0.21 52-71 Bk2 2.5 0.4 0.3 9.0 100 0.16 8.2 0.62 1.0			Ap										tr
16-22 Bt2 21.4 1.7 0.3 0.1 22.5 100 0.84 7.9 0.44 tr 22-29 Bt3 2.3 0.3 0.2 20.0 100 0.66 8.1 0.24 29-37 Btk 2.4 0.4 0.2 19.1 100 0.46 8.3 0.22 37-52 Bk1 2.0 0.5 0.2 11.6 100 0.28 8.2 0.21 52-71 Bk2 2.5 0.4 0.3 9.0 100 0.16 8.2 0.62 1.0	S91TX-297-007												
22-29 Bt3 2.3 0.3 0.2 20.0 100 0.66 8.1 0.24 2.9 9.37 Btk 2.4 0.4 0.2 19.1 100 0.46 8.3 0.22 37-52 Bk1 2.0 0.5 0.2 11.6 100 0.28 8.2 0.21 52-71 Bk2 2.5 0.4 0.3 9.0 100 0.16 8.2 0.62 1.0													-
29-37 Btk 2.4 0.4 0.2 19.1 100 0.46 8.3 0.22 37-52 Bk1 2.0 0.5 0.2 11.6 100 0.28 8.2 0.21 52-71 Bk2 2.5 0.4 0.3 9.0 100 0.16 8.2 0.62 1.0			-	-									
37-52 Bk1 2.0 0.5 0.2 11.6 100 0.28 8.2 0.21 52-71 Bk2 2.5 0.4 0.3 9.0 100 0.16 8.2 0.62 1.0													
52-71 Bk2 2.5 0.4 0.3 9.0 100 0.16 8.2 0.62 1.0			-		-								
[71 00 5.2 0.7 0.5 100 0.11 0.2 0.79 2.0													
		/1-00	DKJ		3.2	0.4	0.3	0.3	100	0.11	0.2	0.75	2.0

⁽¹⁾ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."
(2) Pedon sampled has different surface texture than the map unit in which it is located.

Figure 29.--Clay Mineralogy of Selected Soils

(Analysis by USDA-NRCS National Soil Survey Laboratory, Lincoln, Nebraska. Relative amount: 5--Dominant; 4--Abundant; 3--Moderate; 2--Small; 1--Trace. Dashes indicate that none of the mineral was detected.)

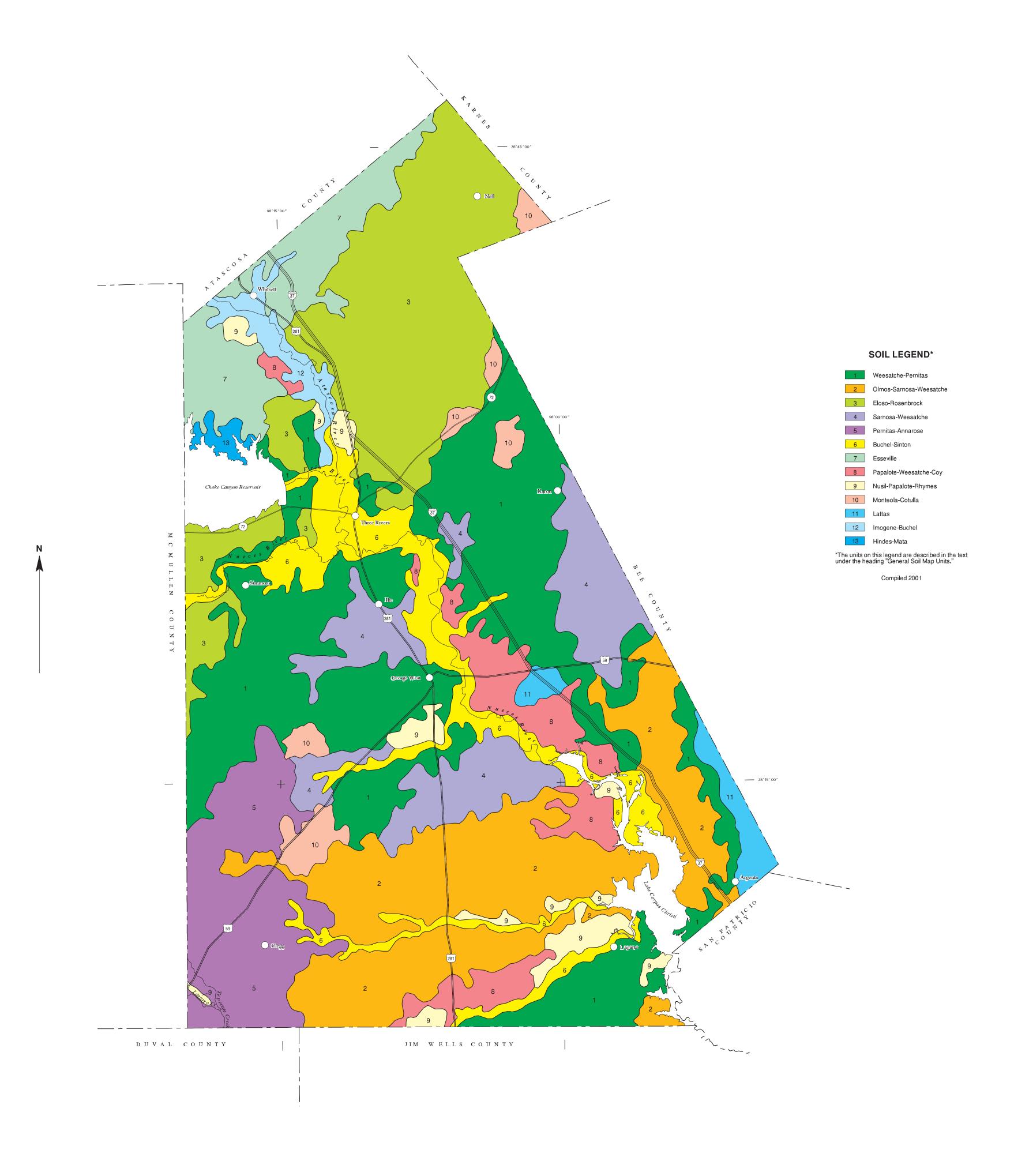
Gadda nama and			Clay Minerals X-ray Diffraction (<2 microns)								
Soil name and sample number	Depth	Horizon	Smectite	Mica	Kaolinite	Quartz	Calcite	Vermiculite			
	In							Ì			
- (4)											
Annarose (1)	0-9	A	4	1	2		3				
S91-TX297-003	25-35	Bk1	5	1	2		2				
	50-69	Cr1	5	1				1			
Buchel (1)	0-8	Ap	3	2	1						
S92TX-297-005	22-32	Bss1	3	2	2	1	1	2			
	42-63	Bss4	3	2	2	1	1				
Choke (1)	0-4	A1	3	2	1		1				
S91TX-297-005	16-24	Bw2	3	2			2				
S91TX-297-005			_								
	34-48	Bk2	2	2			3				
	73-80	2Cr	2	2			1				
Danjer (1,2)	0-6	A1	2	3	2		2				
S92TX-297-003	27-45	Bss2	2	3	2	1	2				
_	0.5										
Esseville (1)	0-5	A	3	2	1	1	2				
S92TX-297-004	15-18	Bkssyz1	3	2		1	1				
	32-36	Bcssyz	3	2		1	1				
Lacoste (1)	0-4	A	1	3	2	1					
S91TX-297-006	10-13	Bt2	1	3	2	1					
Lattas (1)	0-6	Ap	3	2	2	2	1				
S91TX-297-010	24-36	Bss2	3	2	2	3	2				
031111 23, 010	64-80	BCky1	3	2	1	2	2				
		- 1	-								
Olmos (1)	0-8	A	3	2	2		3				
S91TX-297-001	30-41	BCk1	3	1			3				
	75-80	2BCk5	3	1			2				
Pernitas (1)	0-7	Ар	3	3	2	1	2				
S91TX-297-002	20-26	Bt3	3	2	2	1	3				
	48-59	Bk2	3	2	2	1	3				
Sarnosa (1)	0-6	Ap	3	2	2		2				
S91TX-297-004	22-34	Bw3	4	2	2	1	3				
	57-68	Bk3	4	2	2	1	3				
Tiocano (1)	0-8	А	3	3	2	1					
S92TX-297-002	21-38	Bss2	3	3	2	1					
Weesatche (1)	0-6	Ap	2	3	2	1					
S91TX-297-007	16-22	Bt2	3	3	2	1					
22222 237 007	37-52	Bk1	2	3	2		3	1			
	0. 02		<u>-</u>		_			-			

⁽¹⁾ Location of pedon sample is the same as the pedon given as typical for series in "Soil Series and Their Morphology."

⁽²⁾ Pedon sampled has different surface texture than map unit in which it is located.

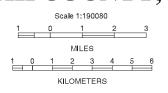
Table 30.--Taxonomic Classification of the Soils

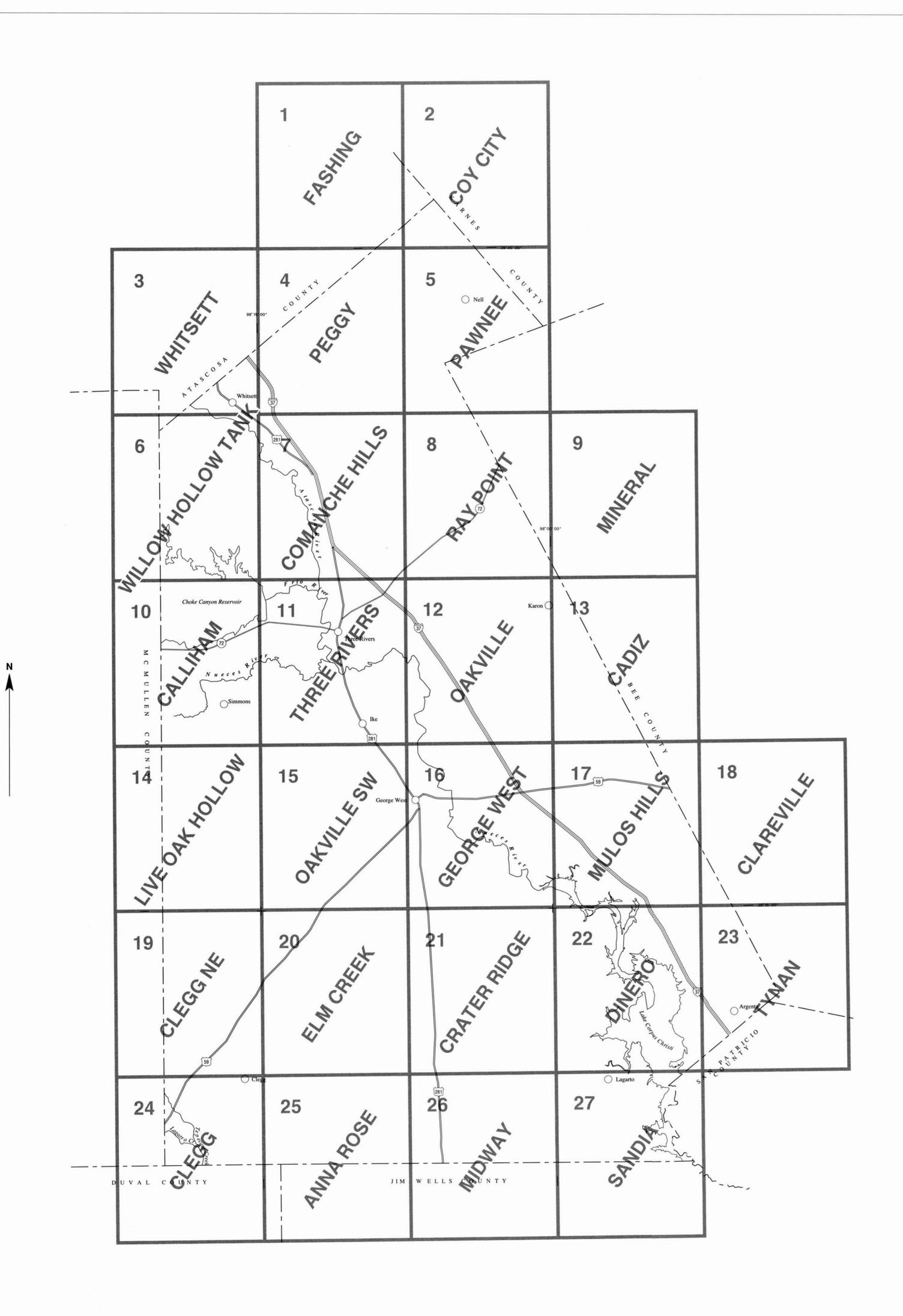
Soil name	 Family or higher taxonomic class
Annarose	 - Coarse-loamy, mixed, superactive, hyperthermic Aridic Calciustepts
Buchel	- Fine, smectitic, hyperthermic Typic Haplusterts
	- Fine, smectitic, hyperthermic Typic Argiustolls
Choke	- Fine-silty, mixed, superactive, hyperthermic Aridic Calciustolls
Clareville	- Fine, smectitic, hyperthermic Pachic Argiustolls
Condido	- Clayey, smectitic, hyperthermic, shallow Petrocalcic Paleustolls
	- Fine-loamy, mixed, superactive, hyperthermic Entic Haplustolls
Cotulla	- Fine, smectitic, hyperthermic Sodic Haplusterts
	- Fine, smectitic, hyperthermic Vertic Argiustolls
	- Fine, smectitic, hyperthermic Typic Haplusterts
	- Clayey, smectitic, hyperthermic, shallow Typic Argiustolls
	- Fine, smectitic, hyperthermic Vertic Haplustolls
	- Fine, smectitic, hyperthermic Sodic Gypsiusterts
	- Clayey, smectitic, hyperthermic, shallow Entic Haplustolls
	- Fine, mixed, active, hyperthermic Petrocalcic Paleustolls
	- Clayey-skeletal, mixed, active, hyperthermic Aridic Argiustolls
	- Fine-loamy, mixed, superactive, hyperthermic Mollic Natrustalfs
	- Loamy, mixed, active, hyperthermic, shallow Petrocalcic Paleustalfs
	- Fine, smectitic, hyperthermic Vertic Argiustolls
	- Fine, smectitic, hyperthermic Typic Haplusterts
	- Loamy-skeletal, mixed, superactive, hyperthermic Aridic Calciustepts
	- Fine, smectitic, hyperthermic Typic Haplusterts
	- Loamy, siliceous, active, hyperthermic Arenic Paleustalfs
	- Coarse-loamy, mixed, superactive, hyperthermic Cumulic Haplustolls
	- Loamy-skeletal, carbonatic, hyperthermic, shallow Petrocalcic Calciustolls
	- Fine, smectitic, hyperthermic Typic Paleustalfs
	- Clayey, mixed, active, hyperthermic, shallow Petrocalcic Paleustolls
	- Clayey, smectitic, hyperthermic, shallow Petrocalcic Calciustolls
	- Fine-loamy, mixed, superactive, hyperthermic Typic Argiustolls
	- Loamy-skeletal, carbonatic, hyperthermic Typic Calciustolls
	- Loamy, mixed, superactive, hyperthermic, shallow Entic Haplustolls
	- Loamy, siliceous, active, hyperthermic Grossarenic Paleustalfs
	- Fine, smectitic, hyperthermic Typic Haplusterts
	- Loamy-skeletal, mixed, superactive, hyperthermic, shallow Petrocalcic
3	Calciustolls
	- Coarse-loamy, mixed, superactive, hyperthermic Typic Calciustolls
Schattel	- Fine, smectitic, hyperthermic Vertic Calciustepts
	- Fine-loamy, mixed, superactive, hyperthermic Cumulic Haplustolls
Tiocano	- Fine, smectitic, hyperthermic Udic Haplusterts
	- Fine-loamy, mixed, superactive, hyperthermic Typic Argiustolls



UNITED STATES DEPARTMENT OF AGRICULTURE NATURAL RESOURCES CONSERVATION SERVICE TEXAS AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP LIVE OAK COUNTY, TEXAS





SOIL LEGEND

Map symbols consist of a combination of letters. The first capital letter is the initial one of the soil name. The second letter is a lowercase letter except for some miscellaneous areas. The third letter is a capital letter to show slope. Symbols for miscellaneous areas do not have a slope letter.

SYMBOL NAME AnC Annarose fine sandy loam, 2 to 5 percent slopes BcA Buchel clay, 0 to 1 percent slopes, occasionally flooded BfA Buchel clay, 0 to 1 percent slopes, frequently flooded CaB Campbellton clay loam, 1 to 3 percent slopes CaC Campbellton clay loam, 3 to 5 percent slopes Choke silty clay loam, 1 to 3 percent slopes CeB CeC Choke silty clay loam, 3 to 5 percent slopes CkA CkB Clareville sandy clay loam, 0 to 1 percent slopes Clareville sandy clay loam, 1 to 3 percent slopes CnA Condido clay, 0 to 2 percent slopes Conquista clay, 1 to 3 percent slopes Conquista clay, 20 to 40 percent slopes CoB CoG Cotulla clay loam, 1 to 3 percent slopes Coy clay loam, 0 to 1 percent slopes CtB CyA Coy clay loam, 1 to 3 percent slopes DAM Danier clay loam, 0 to 1 percent slopes DnA DnB Danjer clay, 1 to 3 percent slopes Eloso clay, 0 to 1 percent slopes Eloso clay, 1 to 3 percent slopes FsA EsB Esseville clay, 0 to 1 percent slopes Esseville clay, 1 to 3 percent slopes ΕvΑ EvB EvC ExC Esseville clay, 3 to 5 percent slopes Esseville gravelly clay, 1 to 5 percent slopes FaC Fashing clay loam, 2 to 5 percent slopes GoB Goliad fine sandy loam, 1 to 3 percent slopes HnD Hindes very gravelly sandy clay loam, 3 to 8 percent slopes ImA Imogene fine sandy loam, 0 to 1 percent slopes LaB Lacoste fine sandy loam, 0 to 3 percent slopes LpB Laparita sandy clay loam, 1 to 3 percent slopes LtA Lattas clay, 0 to 1 percent slopes LtB Lattas clay, 1 to 3 percent slopes MaD Mata gravelly clay loam, 3 to 8 percent slopes Monteola clay, 0 to 1 percent slopes Monteola clay, 1 to 3 percent slopes MoB NuC Nusil fine sand, 1 to 5 percent slopes Odem fine sandy loam, 0 to 1 percent slopes, occasionally flooded AbO OmD Olmos very gravelly sandy loam, 1 to 8 percent slopes Papalote loamy fine sand, 0 to 3 percent slopes PbA Papalote fine sandy loam, 0 to 1 percent slopes PbB Papalote fine sandy loam, 1 to 3 percent slopes PcB PkB Parrita fine sandy loam, 1 to 3 percent slopes Pavelek clay loam, 0 to 3 percent slopes PkC2 PmC Pavelek clay loam, 3 to 5 percent slopes, severely eroded Pernitas fine sandy loam, 2 to 5 percent slopes PnB PtC Pernitas sandy clay loam, 1 to 3 percent slopes Pettus sandy clay loam, 2 to 5 percent slopes PvC Picosa loam, 1 to 5 percent slopes Px Rhymes fine sand, 1 to 5 percent slopes Rosenbrock clay, 0 to 1 percent slopes RhC RoA RoB Rosenbrock clay, 1 to 3 percent slopes RrA Rosenbrock clay, 0 to 1 percent slopes, rarely flooded SaD Sancajo very gravelly loam, 1 to 8 percent slopes SeD ShC Sarnosa fine sandy loam, 3 to 8 percent slopes Schattel clay loam, 2 to 5 percent slopes Sinton sandy clay loam, 0 to 1 percent slopes, occasionally flooded Sinton clay loam, 0 to 1 percent slopes, frequently flooded TcA Tiocano clay, 0 to 1 percent slopes UsC Ustarents loamy, 2 to 5 percent slopes WaB Weesatche fine sandy loam, 1 to 3 percent slopes

Weesatche fine sandy loam, 3 to 5 percent slopes

Weesatche sandy clay loam, 1 to 3 percent slopes

WaC

CONVENTIONAL AND SPECIAL SYMBOLS LEGEND

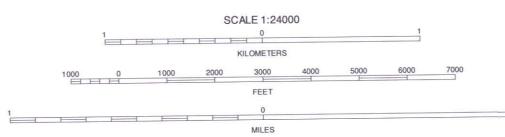
	OTHIDOL	O LLOLIND			
	SPECIAL SYMBOLS FOR SOIL SURVEY				
BOUNDARIES	MISCELLANEOUS CULTUR	AL FEATURES	SOIL DELINEATIONS AND SYMBOLS	CeB EsB	
County or parish	Windmill	X			
ROADS	WATER	FEATURES			
Divided (median shown if scale permits)	DRAINAGE				
ROAD EMBLEM & DESIGNATIONS	Perennial stream	~			
Interstate	Intermittent stream				
Federal	287				
State	(52)				
County, farm or ranch	1283				
PITS					
Gravel pit	X				

98°10′00″ 98°12′30″ 98°15′00″ Joins sheet 4, Peggy SCALE 1:24000 This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Agriculture, NRCS, from 1995 aerial photography. FASHING, TEXAS 7.5 MINUTE SERIES SHEET NUMBER 1 OF 27 1000 0 1000 2000 3000 4000 5000 6000 7000 FEET North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle. 1 0 QUADRANGLE LOCATION



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Agriculture, NRCS, from 1995 aerial photography.

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.



QUADRANGLE LOCATION

COY CITY, TEXAS 7.5 MINUTE SERIES SHEET NUMBER 2 OF 27

MILES

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET



This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Agriculture, NRCS, from 1995 aerial photography. 1 0 1000 0 1000 2000 3000 4000 5000 6000 7000

FEET North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle. QUADRANGLE LOCATION

RAY POINT, TEXAS

7.5 MINUTE SERIES SHEET NUMBER 8 OF 27

1 0

QUADRANGLE LOCATION

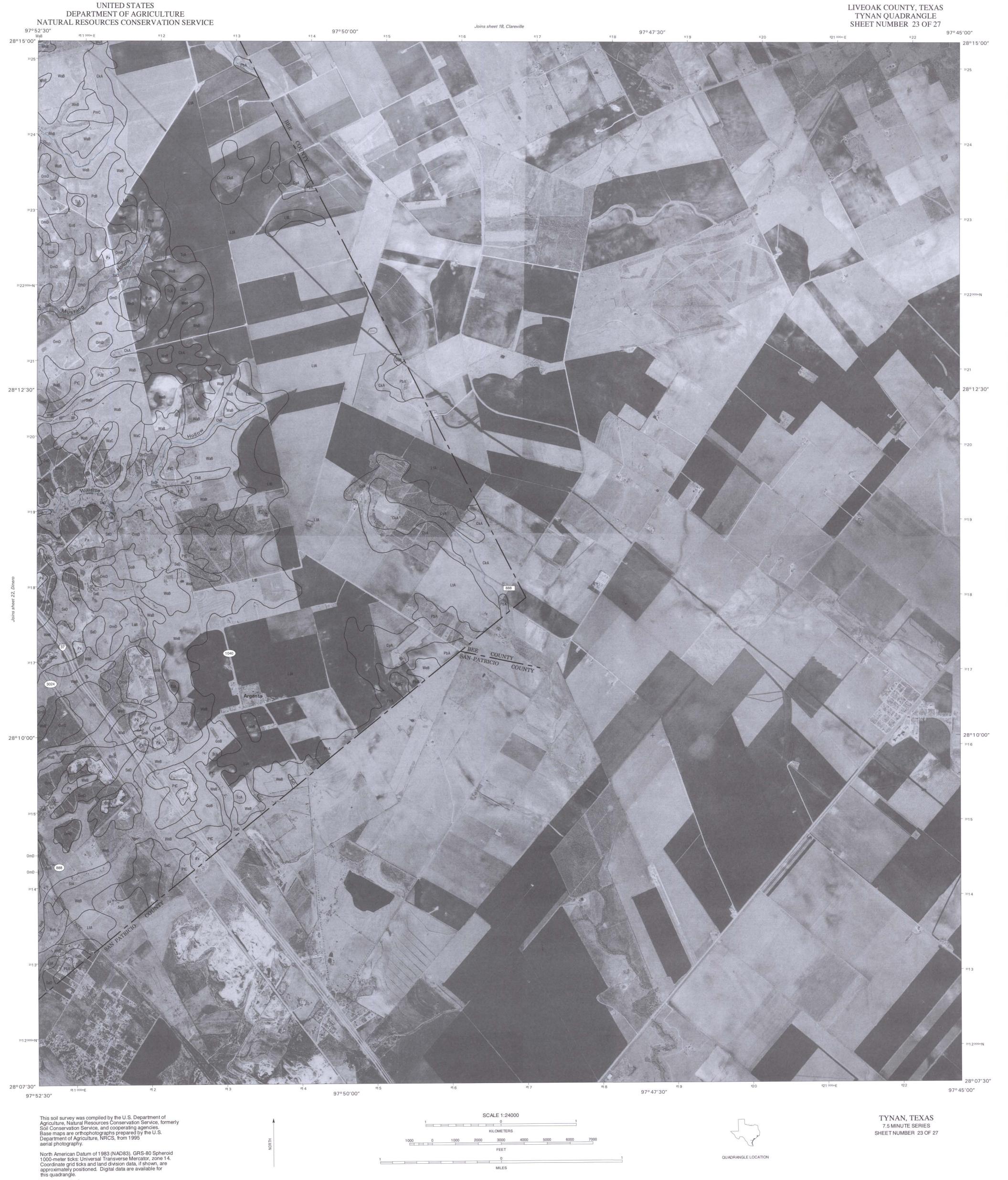
QUADRANGLE LOCATION

North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle.

28°15′00″ e1 5 612 97° 47′30″ 97°50′00″ 97°52′30″ Joins sheet 23, Tynan This soil survey was compiled by the U.S. Department of Agriculture, Natural Resources Conservation Service, formerly Soil Conservation Service, and cooperating agencies. Base maps are orthophotographs prepared by the U.S. Department of Agriculture, NRCS, from 1995 aerial photography. SCALE 1:24000 CLAREVILLE, TEXAS 1 0 7.5 MINUTE SERIES KILOMETERS SHEET NUMBER 18 OF 27 FEET North American Datum of 1983 (NAD83). GRS-80 Spheroid 1000-meter ticks: Universal Transverse Mercator, zone 14. Coordinate grid ticks and land division data, if shown, are approximately positioned. Digital data are available for this quadrangle. QUADRANGLE LOCATION 1 0

28°15′00"

97° 45′00"



MILES

MILES